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Electronic Components

Netherlands

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Sales of electronic components in the Netherlands are projected to surpass $945 million[1] in 1985, climbing an average 7 percent annually from the $178 million reached in 1981 (see table 1). Of the three main component groups, the market for passive components is showing the most significant growth potential, reaching $386 million in 1981 and heading for a projected market size of $510 million in 1985. Semiconductor sales are predicted to climb from $221 million in 1981 to more than $340 million in 1985. Electron tube sales, which peaked at $113 million in 1980, are expected to decline steadily to less than $95 million in 1985.

An accurate assessment of the market, however, cannot be based solely on these figures, but must be viewed with a close eye on the presence and influence of Philips. The giant Dutch electronics firm is both the country's largest consumer of components and its largest potential producer. Without Philips, the Dutch electronics industry is relatively small.

Direct sales of electronic components from the United States stand at about 6 percent of total imports (see table 2), but this percentage is deceiving in two respects. First, a number of U.S. companies supply Holland through production points in the Netherlands and other European countries. Secondly, shipments from Signetics, a Philips subsidiary in the United States, to its parent company falsely enhance U.S. export figures.

End-Users

Output of the Dutch electronics industry topped $3 billion in 1979 (see table 3). Although many Dutch firms, as well as a number of manufacturing units of overseas parent companies, contribute to the Netherlands' total production, most are small firms employing less than 1,000 people and specializing in a narrow segment of the electronics field. Philips is a dominant force in every major product category. Even though Philips may share the spotlight with other large firms in a few specific sectors (such as with Fokker in the military and aerospace area), its across-the-board presence monopolizes the overall electronics picture.

Despite domination of its industry, Philips is not without problems. High wages at home and the robust Dutch guilder place Philips and other Dutch industrial organizations at a serious disadvantage in the international marketplace. In an attempt to stem its declining competitiveness both at home and abroad, Philips is reorganizing operations so as to concentrate manufacturing activities at large production centers and close down smaller ones. It is also shifting a growing number of its production operations to sites outside the Netherlands to capitalize on lower labor costs. Overall, Philips plans to close down 30 to 50 production plants worldwide and reduce its 80,000-person work force in Holland considerably. About 3,000 jobs were deleted in 1980.

Computers and business systems.—The 14 local manufacturers of computers and business systems amassed sales of $1 billion in 1979. In spite of this sale volume, however, consumption of electronic components in this sector may not be as high as expected since several major product groups utilize only a small quantity of components (see table 4). Photocopiers, for example, constitute 35 percent of the sector's output and electronic typewriters another 17 percent.

Dutch production of computers is dominated by Philips Data Systems, which is virtually the only producer of computer systems in the Netherlands. Even with this production edge, though, Philips Data Systems is one of the least successful Philips divisions in the Netherlands as high labor costs and resulting high prices leave it particularly vulnerable to Japanese competitors who offer lower prices and better aftersales service. Recent moves by Philips Data Systems indicate a substantial cutback in employment and production is on the way for plants in Holland as computer manufacturing activity moves from the Netherlands to Eisenfeld, Germany.

The Philips organization also produces a range of word processors and accounting systems, but these products, similarly, have failed to yield significant success.

Other major manufacturers in this sector are Oce-van der Grinten, Gaf, and Rank Xerox. All three concentrate on production of photocopiers. IBM operates a plant in Holland that manufactures electric and electronic typewriters as well as word processors.

The growing world market for minicomputers, microcomputers, word processors, photocopiers, and other products associated with this sector should increase requirements for standard and custom components as well as for microprocessors and memories. Dutch companies have not been able to supply an adequate stock of these necessary components. Even giant Philips relies on its Signetics subsidiary for up to 90 percent of the components required in the production of its microcomputer systems.

Civil and defense communications equipment.—Twenty-four companies contributed to the Dutch communications industry's $904 million output in 1979. Of these, Philips, ITT, and Ericsson dominated, accounting for a combined 70 percent of total production. Major product groups in this sector are telephone equipment, transmitters and receivers, signal control equipment (civilian and military), and navigation equipment. Philips employs approximately 6,000 in the production of civilian telecommunications equipment alone. It employs an additional 6,000 in its defense equipment operation that primarily manufactures radar systems.

Source: "The Electronic Components Market in the Netherlands," Systec Consultants Ltd., 78A Grosvenor Road, Aldershot, Hampshire, GU11 3EA, England, July 1981, performed under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = f.2.45 (1977), f.2.16 (1978), f.2.01 (1979), and f.1.9881 (1980 and subsequent years). Values through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 1.—Netherlands: The market for electronic components, 1977–81, and projected 1985

(in millions of U.S. dollars)

	1977	1978	1979	1980	1981	Projected 1985
Passive components						
Production	142	230	269	239	236	240
Imports	227	326	390	456	488	620
Exports	265	280	334	334	337	350
Market size	104	276	325	361	387	510
Semiconductors						
Production	45	87	117	132	137	150
Imports	189	234	277	286	314	500
Exports	117	155	212	217	230	310
Market size	117	166	182	201	221	340
Electron tubes						
Production	192	145	150	143	131	95
Imports	148	131	146	171	172	170
Exports	234	206	187	202	192	170
Market size	106	70	109	112	111	95
Totals						
Production	379	461	535	514	504	490
Imports	564	691	813	913	974	1,290
Exports	615	640	733	753	760	835
Market size	328	512	615	674	718	945

Source: Maandstatistiek van der Buitenlandse Handel per Goederensoort en per Land (Central Bureau de Statistiek), Statistisch overzicht—elektrotechnische Industrie 1980 (F.M.E.), Mackintosh, and International Trade Administration, Office of Trade Information Services research study "The Electronic Components Market in the Netherlands," (see Additional Information box).

Table 2.—Netherlands: Total import market by country, 1977–81 and projected 1985

(in millions of U.S. dollars)

	1977	1978	1979	1980	1981	Projected 1985
Passive components						
United States	19.5	20.5	23.7	28.7	30	35
Germany	85.8	105.0	127.6	144.5		
Benelux	71.5	86.8	98.2	112.3		
United Kingdom	18.6	22.9	30.9	45.7		
France	14.5	18.6	18.7	19.2		
Switzerland	10.1	14.9	18.7	23.9		
Others	57.1	57.1	72.4	81.6		
Total	277.1	325.8	390.2	455.9	488	620
Semiconductors						
United States	19.1	22.0	17.2	20.5	21	30
Germany	39.1	57.4	46.7	49.1		
France	16.3	23.2	31.6	NA		
United Kingdom	NA	15.3	25.4	37.9		
Japan	6.7	4.6	5.1	5.2		
Others	107.9	111.4	150.9	173.6		
Total	189.1	233.9	276.9	286.3	314	500
Electron tubes						
United States	4.4	8.7	9.2	10.0	10	10
France	66.9	49.6	54.8	NA		
United Kingdom	NA	17.7	26.2	39.9		
Germany	16.5	14.6	16.1	27.0		
Japan	11.6	12.5	3.2	4.3		
Others	48.6	28.0	36.4	89.5		
Total	148.0	131.1	145.9	170.7	172	169

Source: Maandstatistiek van der Buitenlandse Handel per Goederensoort en per Land (Central Bureau de Statistiek) and Statistisch overzicht—elektrotechnische Industrie 1980 (F.M.E.), export statistics for all the countries listed, and International Trade Administration, Office of Trade Information Services research study, "The Electronic Components Market in the Netherlands."

Table 3.—Netherlands: End-user sector economic indicators, 1979

	Total No. of companies	No. of companies accounting for 20% of production	No. of companies accounting for 50% of production	Value of total production ($millions)
Home entertainment products	28	1	1	320
Test instrumentation	61	1	1	309
Communications equipment	24	1	2	904
Electronic medical equipment	16	1	1	315
Computer and business systems	14	1	1	1,116
Military and aerospace equipment	12	1	2	329

Source: Ned. ABC voor Industrie en Handel and International Trade Administration, Office of Trade Information Services research study, "The Electronic Components Market in the Netherlands."

The most important product group in the telecommunications sector is telephone equipment. Export of telecommunications equipment more than doubles that imported into the Netherlands, thanks mainly to large contracts for Philips telephone exchanges in Saudi Arabia and Germany. The latest order from Saudi Arabia calls for 200,000 additional telephone lines including a number of Philips PRX/D digital systems that were introduced in 1980.

Sales of telephone instruments in Holland have been running at 350,000 annually, but are expected to drop to about 200,000 per year in the future. To cushion this decline, manufacturers are trying to offer phones with added sales appeal by providing special features, particularly where business exchanges are concerned. Small exchanges for two to six lines with two or more instruments are being offered with many of the sophisticated features available on larger exchanges. The introduction of electronic phones in 1984 or 1985 and the introduction of digital phones around 1990 should boost sales significantly.

The growing use of electronics by the telecommunications industry is sparking demand for a large range of high-quality components. Full custom integrated circuits, for example, are a burgeoning requirement for producers of telephone handsets and exchanges. A further jump in demand for integrated circuits is expected with the advent of fully digital systems. The use of hybrid circuitry is also on the upswing because of growing needs for delivery over the next few years. By 1984, Fokker assembly lines will turn out aircraft at the rate of three per month. A recent agreement with McDonnell Douglas of the United States to jointly produce a medium-sized civilian airliner based on the Fokker F-29 design means a substantial upsurge in Fokker's future manufacturing activity.

Another major military producer is NV Optische Industries "de Oude Delft", which employs about 1,400. Approximately 40 percent of this firm's production consists of infrared detection systems and other observation devices.

Table 4.—Netherlands: Purchases by major end-users, 1979, 1980, and projected 1985

(in millions of U.S. dollars)

	1979	1980	Projected 1985
Home entertainment products	57	60	68
Test instrumentation	49	54	84
Communications equipment	182	202	291
Electronic medical equipment	40	43	65
Computer and business systems	167	180	230
Military and aerospace equipment	53	60	87
Other	68	75	120
Total	616	674	945

Source: International Trade Administration, Office of Trade Information Services research study, "The Electronic Components Market in the Netherlands."

Future growth in the communications sector is reflected by a component consumption rate expected to climb from $60 million in 1980 to $87 million in 1985. Fokker's component purchases alone—due mainly to its McDonnell Douglas agreement—is expected to double within the next 3 to 4 years.

Use of digital processing for military products is forecast to grow at an expanding rate in the future. Local manufacturers are not expected to keep pace with the projected demand for fully specified military components, thereby opening the door wider to U.S. producers. Manufacturing of optical systems for night vision, fire control, and a variety of other applications is also stepping up the demand for a diversity of optical components.

Home entertainment products.—The home entertainment industry currently is in the doldrums, with little growth projected in the near future. Of the 28 companies that accounted for a $320 million output in 1979, only Philips registered significant production, accounting for 50 percent of the total.

Major products in this sector are color television sets, TV tubes, video cameras, and studio equipment in the video area, and tape recorders, microphones, and studio equipment in the audio field. Production facilities in Holland are utilized primarily for turning out professional equipment or better-established home products such as color TV receivers. Many consumer products are manufactured outside the Netherlands.

As domestic and Western European markets for color TV sets reach a saturation point, Philips is gradually decreasing its production of these units and directing more and more of its attention to video cassette recorders and video disc players, a market currently dominated by Japanese manufacturers. In spite of the growing emphasis on these product lines, most of Philips' activities in Holland are related only to research and development. Major manufacturing facilities are located outside of the Netherlands.

Development of Philip's optical disc systems has created a rising demand for a variety of components including a range of optical products, microprocessors, custom integrated circuits, and high-precision, low-inertia motors. At present, Philips appears capable of supplying the majority of these needed components either through its own domestic manufacturing plants or from its affiliated companies in other countries.

Owing to the flatness of this sector, electronic component purchases have grown at a very slow pace during the past few years. Purchases totaled $57 million in 1979 and edged up to only $60 million in 1980. Projections indicate a growth rate of less than 2 percent through 1985 when consumption should reach $68 million.

Electronic medical equipment.—Production of electronic medical equipment totals about $315 million each year with more than 90 percent of that output going to buyers in other countries. Dutch medical instrumentation manufacturers hold an estimated 18-percent share of the world market. X-ray equipment and heart pacemakers are product areas of particular strength. Although 16 companies are involved in this sector, Philips Medical Systems accounts for about 50 percent of the total production.

The demand for microprocessors is expected to increase in this sector as well as the demand for high-impedance, high-precision analog circuits. The refinement of nonintrusive measurement techniques such as X-ray, nuclear magnetic resonance, and acoustic procedures also increases the demand for all forms of electronic components, particularly transducers. These requirements should raise component consumption in this sector from $43 million in 1980 to $65 million in 1985, but planned shifts of manufacturing activity by Philips to other countries indicate much of this growth will be absorbed by foreign operations.

Test instrumentation.—The test instrumentation sector recorded sales of $309 million in 1979 and shows significant growth potential over the next few years. This expected growth is reflected by component consumption figures forecast to increase from $54 million in 1980 to $84 million in 1985.

The high level of sophistication associated with test equipment, coupled with relatively low volume requirements and the high added value of the products, creates healthy profit opportunities for small, innovative Dutch firms; hence 61 companies are active in this sector. Despite the large number of firms involved, Philips accounts for 50 percent of total output, leaving the remaining 50 percent to be covered by smaller companies such as Tektronics and Enraf-Nonius.

As electronics have grown in sophistication, the demand for automatic test equipment (ATE) has risen sharply, encouraging manufacturers to produce a wide range of products utilized in the fields of test instrumentation, process control, analytical instrumentation, and medical electronics. The demand for more traditional test devices such as timers and counters, however, still remains strong since many purchasing organizations feel they lack a high enough business volume to justify the expense of ATE.

The increasing sophistication of test equipment is putting pressure on component suppliers to produce bigger and better semiconductor products of all types. Likewise, the expanding use of microprocessors in many products is coupled with a spiraling demand for memories and custom and standard integrated circuits. Additionally, due to advanced complexity in test instruments, large and more powerful processors and memories are required, as are high-speed digital and analog components for interface circuitry in high-speed signal detection or sampling equipment. Increased utilization of switching power supplies is also creating a growing demand for high-speed, high-power switching devices.

Market Profiles

Since 1977 the market for electronic components has shown steady but decelerating growth. In 1980 the market increased by about 9 percent, marked by a 4-percent drop in domestic production and a 12-percent rise in imports. Exports inched up by a slight 2 percent. Market growth projections through 1985 are based almost solely on increased import activity as domestic production declines and exports edge upward at a slower pace.

The decrease in Dutch production is tied directly to Philips' plans to move a widening portion of its manufacturing activity to countries offering lower labor rates and currencies weaker than the staunch guilder. Moreover, the projected production slide is an indication of the influence Philips wields from within and without the country. At home Philips and associated companies such as Elcoma are credited with the production of at least 95 percent of Holland's components. This permits Philips to supply itself with components for the majority of its manufacturing activity. Similarly, Philips can call on a far-flung network of subsidiaries such as Signetics in the United States, RTC in France, Mullard in the United Kingdom, and Valvo in Germany to supply many of its import needs. Hence, a more realistic estimate shows Philips and its captive companies providing about 41 percent of the components purchased in the Netherlands, leaving only 59 percent open to foreign manufacturers and the remaining local producers.

High tariffs imposed on electronic components imported into the European Economic Community (EEC) has a definite dampening effect on sales made directly from the United States. By adopting the Japanese practice of selling only a limited number of component lines at very high volume and very low price, however, some U.S. producers still are capable of achieving significant advantages over the competition.

Japanese manufacturers are a major threat to U.S. suppliers as well as to other domestic and foreign producers. Japanese firms have shown particular success in penetrating the capacitor and memory markets. In overall terms, however, sales made by Japanese companies are relatively low, as they apparently are concentrating on large markets such as those in Germany.

Non-Philips firms within the EEC are showing interest in gaining a larger portion of the semiconductor market, with Siemens (Germany) emerging as the greatest potential threat.

From a long-term viewpoint, the secret to success in the Dutch electronics market, as far as producers outside the EEC are concerned, seems to be the establishment of manufacturing plants inside the Community. A number of U.S. firms have taken this step.

Passive components.—The growth of passive components sales has been healthy over the past few years, climbing 10 percent in 1979 and 11 percent in 1980. A slight decline in growth to a modest increase of 7 percent was experienced during 1981 due to recession and production shifts by Philips into other countries. Production dropped nearly 14 percent during the 1980-81 period, but is expected to remain stable through 1985. Imports are forecast to grow at a reduced pace—about 6 percent annually—after jumping more than 15 percent in 1980.

Imports from the United States have always been relatively low in this product category ($30 million in 1981), but sales made by U.S. companies manufacturing in Holland could well double or triple that figure. Purchases from U.S. firms located in Germany, the United Kingdom, and other European countries also enhance these numbers. U.S.-made passive components traditionally have been well received because of good product development and the technical support offered. Lengthy delivery times have been the major criticism voiced by purchasers.

The market for **connectors,** $83 million in 1979, is widely diversified and heavily supplied by U.S. companies located both within the EEC and in the United States (see table 5). AMP has established a production base in the Netherlands that employs 750 workers. Similarly, Berg operates a large manufacturing plant in Holland. ITT, AMP, 3M, and other U.S. firms also supply this market from plants in other European countries.

Fokker, which has great impact on the connector market because of its aircraft manufacturing activities, purchases almost exclusively from U.S. suppliers in the United States (Bendix, AMP, and Cannon, for example) because of its stringent requirements for military-specified products.

Extensive connector purchases are made from a number of European companies such as Siemens, Souriau (France), and Swiss firms including Sotax and Huber & Suhner. Philips purchases some connectors from its captive MBLE in Belgium, but must fill many of its requirements from other sources.

Resistors (market value of $68 million in 1979) for consumer applications tend to be imported from companies in countries with low labor rates such as Piher in Spain. Resistors for commercial and military products, however, are purchased from a variety of foreign-based firms. Among the major suppliers are Beckman, Allen Bradley, and Stackpole in the United States, RIFA in Sweden, and ITT subsidiaries in the United Kingdom and Germany. U.S. companies are particularly strong in supplying printed circuit board (PCB)-mounted potentiometers for professional use.

Table 5.—Netherlands: Sales by product, 1979

(in millions of U.S. dollars)

Passive components	
Capacitors	40.5
Connectors	82.8
Filters, networks, crystals	8.4
Magnetic	19.3
Microwave hardware	—
Printed circuit boards	28.6
Read-out devices[1]	
Relays	51.5
Resistors	67.8
Switches	24.4
Fractional hp motors	1.6
Total	324.9
Semiconductors	
Solid state discrete devices	47.8
Integrated circuits	134.3
Total	182.1
Electron tubes	
Receiving	
Power and special purpose	32.7
Microwave	—
TV, B and W	.4
TV, color	75.6
Total	108.7

[1] Included in solid state discrete devices.

Source: Maandstatistiek van der Buitenlandse Handel per Goederensoort en per Land (Central Bureau de Statistiek), Statistisch overzicht—elektrotechnische Industrie 1980 (F.M.E.), Mackintosh, and International Trade Administration, Office of Trade Information Services research study, "The Electronic Components Market in the Netherlands."

The $52 million **relay** market in Holland is highly constrained by domestic regulations, benefiting local producers and holding down imports directly from the United States. A number of U.S. companies such as Square D, ITT, and AMP have established plants in Europe to produce relay products. Both the United Kingdom and Germany have a large number of relay-manufacturing firms other than those owned by U.S. companies, but these producers vary widely in components made, with some turning out high-cost commercial and industrial relays and others manufacturing low-cost, high-volume relays for PCB mountings. Philips subsidiaries in the United Kingdom, Belgium, and Germany also produce large quantities of relays.

Many companies now involved with relay production are attempting to change their product range to counter an expected long-term market decline and are branching out into other electronic products such as programmable controllers.

Showing a value of $41 million in 1979, the **capacitor** market is extremely price and delivery sensitive, with

Dutch companies willing to shop around for the best deal. Because of these highly competitive conditions; it is difficult for firms in the United States to actively participate in this market. The exceptions are U.S.-based companies such as AVX and Sprague which produce high-reliability and military-specified capacitors. These companies, however, along with several other major U.S. capacitor makers, also have set up production facilities in Europe to better cope with competitors such as Siemens which hold a strong position in the Dutch market.

The market for **printed circuit boards** was valued at $29 million in 1979 with the majority of imports coming from Philips' plants in Belgium and Germany. In addition to imports emanating from captive Philips sources in Germany, other German producers have also been making inroads into the PCB market through open competition. Imports from the United States tailed off slightly in 1980 after rising sharply the year before.

PCB's most in demand in Holland are double-sided, through-hole plated boards. Requirements for multilayer boards also have been increasing steadily.

During recent years the $24 million market for **switches** has been tending away from panel-mounted switches and swinging more toward PCB-mounted devices. There has also been a sharp increase in the use of keyboard type switches of all sorts.

In-country production of switches is dominated by Philips, although a number of small companies also are active in this market. The level of imports has been dropping for several years with German and Belgian companies being the top suppliers from abroad.

Only a limited number of companies are active in the **magnetics** market ($19 million in 1979), with local production earmarked primarily for special-purpose products. The majority of high-volume standard products are supplied by German companies, which exported nearly $15 million worth of these components in 1979. Few opportunities exist in this market for U.S. suppliers as reflected in the drop in sales from $3 million in 1977 to less than $2 million in 1980.

With a market value of only $8 million, the demand for **filters, networks, and crystals,** is less than that in other countries. A few small companies produce a limited range of products for consumption by the military and telecommunications industries. Some growth is projected in this category with Japanese firms expected to make the largest gains at the expense of German suppliers.

No official statistics are available for the **readout devices** market, but it has been assessed at about $7 million. The majority of displays are imported, with U.S. firms supplying a significant number of them. German and French companies also contribute to import sales. Market growth for these devices is expected to be in the areas of numeric or full alphanumeric displays and dot matrix displays, with the main types being liquid crystal or plasma. In volume terms, the sale of simple light-emitting diodes is still growing, but the market is not increasing in value terms.

Even though Philips uses a variety of **motors** for electronic applications, the market for them is small (less than $2 million in value), and most are supplied by captive sources in Germany and the United Kingdom.

Statistics for **microwave hardware, transducers,** and **wires and cables** are scant to nonexistent, although some growth is expected in each product category. Microwave components are experiencing a modest increase in demand because of a rise in production of security and surveillance systems. The main area of growth for wires and cables is within the ribbon cable market. Even with the growth of ribbon, however, the increased complexity of equipment now being produced has created a growing requirement for hook-up wire. A gradual increase in the demand for transducers is being created by their use in products ranging from energy management systems to consumer goods.

Semiconductors.—After a dramatic surge of 38 percent in 1978, the semiconductor market adjusted itself and has been increasing at a more natural clip, rising 7 percent in 1980 and climbing a solid 10 percent in 1981. During the 1981-85 period, semiconductor sales are projected to grow an average 11 percent annually.

The market for integrated circuits (IC's) totaled $134 million in 1979 and has been expanding rapidly since. Such growth is expected to continue, but at a slightly reduced rate. Because of Philips domination of the IC market in Holland, U.S. suppliers find it difficult to establish a beachhead here. Even though Philips imports a significant volume of these components from Signetics, the U.S. share of total IC imports in 1977 was only 15 percent and that dipped to 10 percent in 1980. A large portion of this decline can be attributed to the increasing number of U.S. production facilities being established in European countries. Some major U.S. firms that fall into this category are ITT's Intermetal in Germany and British-based companies such as National Semiconductors, Motorola, General Instruments, Texas, and Siliconix.

Philips affiliates in other countries (Valvo in Germany, RTC in France, and Mullard in the United Kingdom) tend to obscure these nations' export participation in the Dutch IC market. Nevertheless, a number of foreign-owned companies do have a presence in this market, most notably Siemens and AEG-Telefunken (Germany), Thompson-CSF (France), Plessey and GEC (United Kingdom), and NEC (Japan).

Although the threat of growing penetration by Japanese suppliers is an ever-present consideration for domestic and foreign producers alike, Japanese sales have been quite low ($2 million in 1980), probably due to Philips' closed-door purchasing policies. Japanese companies, however, have been supplying a higher percentage of memory devices even though U.S. firms still control more than 50 percent of that market. The increasing use of microprocessors has led to a corresponding rise in the market for memory devices and also helps expand a range of peripheral devices.

Utilization of full-custom circuits is limited to Philips and communications companies such at ITT and Ericsson. This market is not expected to grow significantly during the next few years. Awareness of the benefits offered by semi-custom designs (gate arrays, uncommitted logic arrays, and linear arrays) is expanding, and this market should climb rapidly. Philips' domination in this segment of the market prevents it from being overly attractive to outside suppliers.

The market for hybrid circuits has been static for several years and is expected to grow very slowly in the future despite their use in a number of various industries.

The overall market for discrete devices amounted to $48 million in 1979 and has been growing at an average annual rate of 6 percent. This pace is expected to decline slightly over the next few years. Main growth products are opto-electronic devices, power transistors, rectifiers, and thyristors.

Philips has a particularly advantageous position in this market, supplying it from domestic branches and from affiliates in surrounding countries. Imports of discrete devices supplied directly from the United States amounted to only 3 percent of the market in 1980, but volume has been increasing slowly the past 4 years. Japanese firms, meanwhile, have been losing sales in recent years, selling $5 million worth of these components in 1977 and only $3 million in 1980.

Electron tubes.—The Dutch electron tube market has been declining since 1980 and is forecast to slide another 15 percent by 1985. Since professional and industrial tube markets are expected to remain strong and show future growth, this overall decline must be pegged to the general softening of TV tube sales which constitute nearly 70 percent of the market. The majority of color and black-and-white television tubes are imported from Philips subsidiaries in Europe. Some Japanese firms such as Sony and Toshiba also are active in the market.

Imports of microwave, power, and optical tubes from the United States exceed those from any other nation. Major U.S. suppliers in this market are Amperex, Litton Industries, RCA Tubes, Varian, and Watkins Johnson. These companies historically have held a strong position in the market because they can supply more advanced products than those available from other foreign firms.

Although the professional tube market is projected to grow in the future, U.S. suppliers are expected to retreat from it, due partially to the growing emphasis on optical tubes. Conversely, firms such as Thompson-CSF (France) and English Electric (United Kingdom) are expected to strengthen their position with increasing sales of optical tubes for military and research applications. These same European companies also are expected to expand their sales in the microwave tube market.

Business Practices

Only a handful of major component producers in the Netherlands such as Philips, ITT, and Texas Instruments sell directly to clients because of the high cost of maintaining a full-time sales staff. Most companies, instead, rely heavily on distributors to promote their products and service customers. Finding such a representative presents a problem even though a large number of them are in business. Most distribution agencies are small and stock only a limited range of products. Additionally, many are seeking ways to reduce the range of products they already carry and looking to cut overhead expenses by pulling back on technical support offered. A growing number of distributors no longer employ outside salespeople, preferring to depend on telephone contacts with potential buyers. All of these cost-trimming techniques are being met with buyer criticism in varying degrees.

Sales and delivery agreements.—Quite a few component buyers are drastically changing their stocking and ordering policies. Many have made a concerted effort to reduce stock on hand and have resorted to buying components for a specific need as it arises. This means purchasers are relying more and more on distributors to provide fast-turnaround service for low-volume orders.

Advertising.—Dutch magazines relevant to the electronics industry are very limited, so many component buyers commonly read periodicals published in other countries, mainly those from the United States, the United Kingdom, and Germany. Nonetheless, additional advertising in local magazines is recommended.

Distributors encourage component suppliers to furnish promotional and technical literature to advance and support their products. Ideally, distributors prefer to offer end-users comprehensive technical materials in a notebook or booklet form.

Only two major electronics-related exhibitions are held in the Netherlands on an annual basis, the Fiarex Exhibition in Amsterdam each November and Microelectronica in Eindhoven each February. Many component buyers attend exhibitions and conferences in other European countries. Among the most popular are Electronica in Munich (November); The Electronic Components Industry Fair (June), and the All-Electronics Show (April) in London; the International Exhibition of Electronic Components in Paris (April); and Internepcon held in Brighton, England (October).

Tariffs and Standards

Movement of all electronic components within the European Economic Community is exempt from tariffs. Components imported into Holland from outside the EEC are subject to the Community's common tariffs that range from 5.2 percent to 17 percent. No additional duties are imposed by national or local governments. Two tariff exemptions apply in Holland, both concerning specific product groups originating in the Far East.

At present, no governmental standards apply to electronic components used in the Dutch market. A number of varying standards do exist, however, within specific industries. The aircraft industry, for example, requires that virtually all components meet U.S. aircraft specifications. Telecommunications companies set their own standards and enforce them with stringent tests and inspections before accepting the components.

Additional Information

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The Survey summarizes a 59-page research report prepared by Systec Consultants, Ltd., Aldershot, Hampshire, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in the Netherlands and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from:

National Technical Information Service
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Springfield, Virginia 22161
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When placing an order for this research, please request "The Electronic Components Market in the Netherlands," ITA 81-11-507, July 1981.

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CMS 83-054, January 1983

Country Market Survey

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CMS

Agricultural Machinery and Equipment

Ivory Coast

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

From the Ivory Coast's independence in 1960 through the late 1970's, the country's agricultural economy expanded steadily, propelled by healthy export earnings from cocoa and coffee. Purchases of agricultural equipment and machinery soared, rising from less than $9 million[1] in 1975 to a peak of $30 million in 1979 (see table 1). However, the collapse of cocoa and coffee prices sent the market tumbling. Sales of agricultural machinery fell to $13.7 million in 1981, less than half their 1979 level. Industry observers expect lagging export earnings to restrict market growth in 1982, but they foresee a recovery of demand in the 1983-86 period, with 1986 sales projected at some $31 million.

In its 1981-85 Five-Year Plan, the Ivory Coast Government continues to place priority on agricultural development, with some $1.2 billion to be invested over the plan period. Revenues from the nascent offshore petroleum industry will also be directed to agriculture once the country becomes a net oil exporter in 1983 or 1984. The current plans includes a mechanization program for the northern savannah that encourages small-scale technology, while a joint Ivory Coast-Brazilian venture to bring 12,000 hectares[2] (ha) into soybean production is expected to stimulate demand for larger equipment. Sales are also forecast to rise as farmers now being introduced to small machines progress to medium-sized tractors within a few years and as programs for lowland rice production require higher-capacity cultivation equipment.

The number of tractors sold fell from 311 in the first 9 months of 1979 (the only data available) to fewer than 200 in the following 12 month period (see table 2). Nevertheless, tractors accounted for about 40 percent of the 1981 market. Demand for 40-75 horsepower (hp) machines is expected to remain sluggish through 1983, but should climb more rapidly thereafter as successful farmers upgrade their equipment. A 1986 market of $7.2 million is forecast. Tractors over 75 hp are expected to sell well throughout the 1982-86 period. Replacement buying by large-scale sugar plantations is expected to account for most of the demand, but trade sources also foresee some substitution of large farm tractors for caterpillar-tread equipment in land clearing, especially on the Northern savannah. By 1986, annual sales of tractors over 75 hp are projected at $4 million, representing 22 percent average annual growth over 1981 levels.

The market for cultivation, planting, and fertilizing machinery, valued at $3.24 million in 1981,

Table 1.—Ivory Coast: Market[1] for agricultural machinery and agri-related equipment, 1979, 1981, and projected 1986

(in thousands of U.S. dollars)

	1979	1981	1986
Tractors (40-75 hp) and parts			
Production	—	—	—
Imports	2,044	4,030	7,500
Exports	105	30	300
Market size	1,939	4,000	7,200
Tractors (over 75 hp) and parts			
Production	—	—	—
Imports	8,236	1,551	4,100
Exports	571	50	100
Market size	7,665	1,501	4,000
Soil cultivation, planting, and fertilizing equipment			
Production	800	1,440	3,000
Imports	3,438	2,000	2,850
Exports	22	200	350
Market size	4,216	3,240	5,500
Harvesting, threshing, and mowing machinery			
Production	—	—	20
Imports	10,511	495	5,000
Exports	43	—	150
Market size	10,468	495	4,870
Spraying and dusting equipment			
Production	—	—	—
Imports	1,258	1,850	2,500
Exports	44	50	80
Market size	1,214	1,800	2,420
Irrigation equipment, including sprayers			
Production	—	—	—
Imports	1,766	800	2,000
Exports	17	20	50
Market size	1,749	780	1,950
Grading, sorting, and cleaning machinery			
Production	—	—	—
Imports	2,329	509	2,520
Exports	4	10	20
Market size	2,325	499	2,500
Other agricultural machinery and equipment			
Production	330	1,000	1,800
Imports	364	410	920
Exports	2	10	20
Market size	692	1,400	2,700
Total market			
Production	1,130	2,440	4,820
Imports	29,946	11,645	27,390
Exports	808	370	1,070
Market size	30,268	13,715	31,140

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Parts are excluded.

[2] Includes horticultural, poultry raising, and agricultural aviation equipment.

Source: International Trade Administration, Office of Trade Information Services research report, Ivoirian trade statistics, and trade source estimates.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=CFA213 (1979), CFA211 (1980), and CFA269 (1981 and subsequent years). Values through 1981 are expressed in current rather than constant dollars; values for 1982 and subsequent years are expressed in 1981 constant dollars.

[2] One hectare (ha)=2.47 acres.

comprises mainly small-scale or animal-drawn equipment. Offset disc plows and harrows are popular, and a limited demand exists for seed drills, fertilizer spreaders and power tillers. Sales are projected to expand a relatively slow 11 percent a year because sugar plantations and commercial fruit growers are overequipped in light of currently dismal demand prospects. However, the market could climb higher than the $5.5 million projected for 1986 if a 14,000 ha pasture improvement program now under study receives approval and financing.

Harvesting equipment sold in the Ivory Coast consists of sugarcane harvesters, soybean combines, mowing machines (mostly rotary brushcutters and mowers), and some motorized stationary threshers and corn shellers. The high value of individual cane harvesting machines makes the market subject to sharp yearly fluctuations. Sales fell from over $10 million in 1979 to about $500,000 in 1981. But trade analysts expect some replacement buying of sugarcane equipment over the 1982-86 period, and the soybean project should stimulate demand for combines. Assuming an annually phased replacement of cane harvesters, the market for harvesting equipment is projected to rise to some $2 million in 1983 and to almost $5 million in 1986.

Sales of spraying and dusting equipment, $1.8 million in 1981, are foreseen rising a moderate 6 percent per annum as Ivoirian agriculturalists launch regeneration programs for cocoa and coffee plantations. Continued expansion of cotton production should also stimulate demand, which focuses on motorized and manual knapsack sprayers, ultra-low volume (ULV) dosage appliances, and some tractor-drawn boom sprayers. A $2 million market is forecast for 1986.

Industry sources anticipate a resurgence of demand for irrigation equipment after 1983. Sales stood at $780,000 in 1981 and are projected to climb to $2 million by 1986. Growth potential is attributed to revived pineapple production, expansion of market gardening around cities, and development of a flower export trade.

The market for graders and sorters is expected to show more immediate growth as a result of plans to step up poultry and egg production. In all, a five-fold expansion is projected, from $500,000 in 1981 to $2.5 million in 1986. Emergence of a domestic poultry industry also underlies much of the increase anticipated in the market for other agricultural, horticultural, and poultry equipment. From $1.4 million in 1981, sales are forecast to climb an average of 14 percent annually to $2.7 million in 1986.

Competitive Environment

Imports worth $11.6 million supplied about 85 percent of the market for agricultural machinery in

Table 2.—Ivory Coast: Tractor purchases by size and manufacturer, 1979,[1] 1980, and 1981

	1979		1980		Share	
	Units	Share (%)	Units	Share (%)	Units	Share (%)
Tractors of 60-80 hp						
Fiat	111	48	99	73	76	43
Renault	12	5	4	3	61	35
International Harvester	8	3	11	8	9	5
Massey-Ferguson	57	25	4	3	8	4
SAME & Lamborghini	2	1	2	2	7	4
John Deere	—	—	3	2	5	3
Ford	23	10	3	2	5	3
UTB	8	3	1	1	—	—
Ebro	10	5	8	6	5	3
Total	231	100	135	100	176	100
Tractors over 80 hp						
Fiat	2	2	19	30	8	27
SAME & Lamborghini	—	—	—	—	7	23
Renault	26	33	1	1	5	17
Massey-Ferguson	3	4	3	5	4	13
Ford	42	52	—	—	4	13
Ebro	7	9	14	22	2	7
International Harvester	—	—	27	42	—	—
Total	80	100	64	100	30	100

[1] Data for 1979 available only for the 9-month period from January to September.
Source: Ivoirian trade source estimates.

1981, including all the more sophisticated and large-scale equipment items. Local manufacture is limited to relatively simple tractor- or animal-drawn implements and trailers. As the Ivory Coast's agricultural economy improves over the 1981-86 period, local buyers are expected to turn increasingly to high-quality foreign-built farm equipment, boosting imports an average 19 percent annually to $27 million in 1986. However, the Ivory Coast, traditionally an open economy, may tighten import restrictions in light of current foreign exchange shortages.

U.S. suppliers.—American vendors have been particularly hard hit by the demand slump; their sales fell from some $6.3 million in 1979 to a mere $790,000, or 7 percent of imports, in 1981 (see table 3). Biggest declines came in U.S. sales of large tractors (over 75 hp) and harvesting and mowing machinery. But these same categories of equipment are projected to spearhead the resurgence of U.S. sales over the 1981-86 period. Shipments of large tractors are foreseen multiplying fourfold (to $615,000), while a twelvefold expansion (to $1.25 million) is anticipated in American-sourced imports of harvesting and mowing equipment. U.S.-brand farm machines are often shipped to Ivory Coast from European or Australian plants, but some John Deere and International Harvester equipment comes directly from the United States. Chemical Industries is a prominent supplier of CAMECO harvesting equipment for sugarcane. Good demand prospects are foreseen for U.S.-built sugarcane harvesters and loaders; silage, forage, and grain harvesters; and forage handling equipment.

In the market for cultivation equipment, American vendors can expect to garner a 10 percent share of projected 1986 imports with sales of $285,000. U.S. successes are largely accounted for by plows, subsoilers, and other heavy cultivation equipment. Rome Industries is a prominent supplier. Salable items include disc and chisel plows, cultivators, disc harrows, soil pulverizers, disc and rotary tillers, and subsoilers. No American participation is reported in the markets for spraying and dusting machines or irrigation equipment, though power-operated pesticide sprayers would reportedly face good sales prospects. U.S. manufacturers supply about half of imported sorting/grading equipment. By 1986, they anticipate annual sales of $1.1 million, a fourfold increase over 1981. Local buyers have expressed strong, spontaneous interest in U.S.-built poultry equipment. Incubators and brooders as well as egg washers, sorters, graders, and handlers are considered highly salable.

U.S. success in the Ivory Coast depends heavily on the type of credit terms offered and on evidence of a commitment to the market. American suppliers have taken a back seat to third-country vendors who provide lenient terms, usually as an integral part of an agricultural development project. Too, U.S. prices are apt to fluctuate against the local currency, which is tied to the French franc. Some loal buyers omplain that American companies offer indifferent aftersales service and are unable to communicate in French. With a moderate marketing effort, however, U.S. manufacturers could make themselves more widely known here, opening the door to expanded future sales of specialized equipment.

Third-country suppliers.—Ivory Coast's purchases of agricultural equipment from France amounted to $4.5 million in 1981, about 38 percent of total imports. Traditional trading links between the two countries remain strong, and French financing underwrites many major agricultural projects. In 1980, France provided some $2.8 million in grants and $33 million in soft loans for rural development. The result has been an entrenched market position for French suppliers, whose sales are expected to climb at a 14 percent annual rate over the 1981-86 period. Their imports are projected at nearly $9 million for the latter year.

French firms do well with a wide range of equipment. In 1981 they supplied 30 percent of imported small tractors (Renault, Bouyer), 55 percent of cultivation/planting equipment (Gard, Huard, Jean le Bru, Nodet-Gougis), 48 percent of spraying and dusting machines (Berthoud, Tecnoma), 75 percent of irrigation equipment, and 50 percent of other agricultural, horticultural, and poultry equipment. France's La Tourangelle has a virtual monopoly on fruit grading equipment for plantations, while French-built (U.S. licensed) Dickey-John moisture meters for coffee and cocoa are the only ones with official approval.

Italian manufacturers supplied about 20 percent of imports in 1981 with machinery, mostly tractors, valued at $2.31 million. Fiat is known to provide the lowest cost tractors available and also sells a substantial volume of vehicles over 75 hp. Annual increases of some 17 percent are forecast for Italian-source imports, with 1986 sales projected at over $5 million.

Germany's Deutz has established itself in the tractor market with reliable machinery and excellent after-sales support. German vendors commanded about 12 percent of imports of 50-75 hp tractors in 1981, and are projected to account for 18 percent ($1.35 million) in 1986. Most other German sales are made by Solo, which has been supplying motorized knapsack sprayers to SATMACI, the Ivoirian coffee and cocoa extension agency, for over a decade. For 1986, total German shipments are forecast at $2.3 million.

A quadrupling of sales over the 1981-86 period is projected for Brazilian manufacturers. Aggressive export promotion credit programs and increasing investment in Ivory Coast agriculture are expected

Table 3.—Ivory Coast: Imports of agricultural machinery and agri-related equipment by country of origin 1979, 1981, and projected 1986

(in thousands of U.S. dollars)

	1979		1981		1986	
	Value ($)	Share (%)	Value ($)	Share ($)	Value (%)	Share ($)
Tractors (40-75 hp) and parts						
United States	—	—	160	4	150	2
Italy	820	40	1,410	35	3,000	40
France	456	22	1,210	30	1,875	25
Germany	356	18	483	12	1,350	18
Brazil	87	4	403	10	1,125	15
United Kingdom	163	8	120	3	—	—
Others	162	8	244	6	—	—
Total	2,044	100	4,030	100	7,500	100
Tractors (over 40-75 hp) and parts						
United States	2,190	27	155	10	615	15
Italy	692	8	775	50	1,845	45
France	1,651	20	264	17	820	20
United Kingdom	860	10	201	13	—	—
Spain	2,723	33	109	7	205	5
Germany	120	2	31	2	82	2
Brazil	—	—	—	—	492	12
Other	—	—	16	1	41	1
Total	8,236	100	1,551	100	4,100	100
Soil cultivation, planting, and fertilizing equipment						
United States	289	8	120	6	285	10
France	1,443	42	1,100	55	1,511	53
Italy	160	5	120	6	171	6
Brazil	71	2	100	5	285	10
United Kingdom	150	4	60	3	86	3
Germany	52	2	20	1	57	2
Other	1,273	37	480	24	455	16
Total	3,438	100	2,000	100	2,850	100
Harvesting, threshing, and mowing machinery						
United States	3,288	31	100	20	1,250	25
Australia	1,454	14	150	30	1,500	30
Brazil	401	4	150	30	750	15
France	2,778	26	60	12	750	15
Other	2,590	25	35	8	750	15
Total	10,511	100	495	100	5,000	100
Spraying and dusting equipment						
United States	—	—	—	—	—	—
France	298	24	888	48	1,250	50
Germany	535	42	648	35	675	27
United Kingdom	75	6	185	10	250	10
Belgium/Luxembourg	188	15	37	2	125	5
Other	162	13	92	5	200	8
Total	1,258	100	1,850	100	2,500	100
Irrigation equipment, including sprayers						
United States	—	—	—	—	—	—
France	741	42	600	75	1,500	75
Germany	467	26	40	5	100	5
Other	558	32	160	20	400	20
Total	1,766	100	800	100	2,000	100

(contnued on page 6)

to account for the surge in imports from Brazil, which are projected at over $2.7 million in 1986. In many cases, equipment will come from U.S. subsidiaries there. Ford tractors, formerly shipped to Ivory Coast from the United Kingdom, are likely to be manufactured in Brazil in the future. Brazilian-built Sperry New Holland equipment commands a substantial share of the market for harvesting machinery.

Significant sales by other third-country importers are usually restricted to a few selected markets. U.K.-source imports amounted to less than $700,000 in 1981, but British firms do well with herbicide applicators and miscellaneous agricultural, horticultural, and poultry equipment. The Belgian/Dutch firm Vicon leads in sales of tractor-mounted fertilizer spreaders, while Australian competitors (Claas, Massey-Ferguson) are known for their sugarcane harvesters.

Domestic suppliers.—Local production of agricultural machinery and related equipment amounted to $2.4 million in 1981. Expansion of some 14.6 percent a year is predicted, raising the value of output to $4.8 million in 1986. Abidjan Industrie, the principal domestic manufacturer, is a joint Ivoirian/French company manufacturing railway equipment, refrigeration machinery, castings, and mechanical equipment. Output of agricultural machinery is estimated at 800 planters, 400 harrows, and 400 trailers for use with small tractors, as well as a range of animal-drawn cultivation equipment. The company is currently negotiating to build tractor-drawn rice threshers using some parts imported from Brazil and has also expressed interest in manufacturing larger scale cultivating implements.

Several smaller firms are active locally. FRACASSI, privately owned, manufactures harvest and tank trailers as well as a range of manual equipment for pineapple production and fermenting tanks for cocoa. Atelier de Fabrication Mecanique also builds trailers. An Ivoirian plant may begin turning out the French-designed 28 hp Bouyer tractor in the near future. Production, originally slated to begin in 1982, is unlikely to start before 1983.

Major Purchasers

Despite the emergence of oil production, agriculture remains the backbone of the Ivory Coast's economy. Together with forestry, farming accounts for three-fourths of total export earnings and for an even larger share of the country's total output. Cocoa and coffee, the major export crops, are produced almost exclusively by smallholders on a combined total area of more than 2.3 million ha. Use of agricultural machinery is limited, as it is on staple food crops. The current 5-year development plan calls for a 25 percent increase in coffee output over the 1981-85 period and a 40 percent hike in cocoa production. Other crops grown predominantly by smallholders include cotton and rice. About 6 percent of cotton acreage (1979 total: 107,000 ha) is farmed mechanically, while irrigated rice acreage (less than 2 percent of total rice acreage) requires small-scale mechanized equipment.

Table 3.—Ivory Coast: Imports of agricultural machinery and agri-related equipment by country of origin 1979, 1981, and projected 1986—Continued

(in thousands of U.S. dollars)

	1979		1981		1986	
	Value ($)	Share (%)	Value ($)	Share ($)	Value (%)	Share ($)
Grading, sorting, and cleaning machinery						
United States	534	23	255	50	1,134	45
France	730	31	152	30	630	25
Other	1,065	46	102	20	756	30
Total	2,329	100	509	100	2,520	100
Other agricultural machinery and equipment						
United States	—	—	—	—	—	—
France	150	41	205	50	414	45
United Kingdom	57	16	123	30	230	25
Other	157	43	82	20	276	30
Total	364	100	410	100	920	100
Total imports	29,946		11,645		27,390	
Total imports from U.S.	6,301		790		3,434	
U.S. share of total imports	—	21	—	7		13

Source: International Trade Administration, Office of Trade Information Services research report, Ivoirian trade statistics, and trade source estimates.

Ivory Coast.—Best sales opportunities for U.S. exporters

Wheel Tractors
- 60-80 horsepower
- Over 80 horsepower
- Implements and attachments for wheeled tractors

Soil cultivation, planting, and fertilizing equipment
- Disc plows
- Chisel plows
- Cultivators, tractor drawn or tractor mounted
- Harrows, tractor disc
- Soil pulverizers
- Disc tillers
- Rotary tillers
- Subsoilers

Harvesting, threshing, and mowing equipment
- Sugarcane harvesters and loaders
- Silage choppers; forage and grain harvesters
- Loaders/unloaders; handling equipment

Spraying and Dusting Equipment
- Pesticide sprayers, power operated

Grain and Seed Specialty Equipment
- Grain and seed testing instruments (moisture, quality, damage, color, etc.)

Poultry Equipment
- Incubators and brooders
- Feeding and watering units
- Egg washers, sorters, graders, handlers

Agricultural Aviation
- Specialty aircraft for crop dusting/spraying, fertilizing
- Applicators and implements; attachments for aircraft

Source: Ivoirian trade source estimates.

Large farms, including plantations, offer greater opportunities for equipment sales. Sugar is produced only on irrigated plantations run by the State. Oil palm, rubber, and coconuts are grown by smallholders as well as on plantations managed by State or mixed economy enterprises. Increases of 90 percent are projected for coconut and rubber production over the 1981-85 period, though these predictions could prove overly optimistic. Commercial pineapple and banana production takes place on small to medium-sized private farms. Beef is reared using extensive grazing, but there is substantial intensive poultry and hog production. Dairying is virtually nonexistent.

Government organizations.—State controlled organizations account for some 80 percent of the market for tractors and tractor-drawn machinery. Despite the Ivoirian Government's intention to reduce its direct involvement in production, government agencies and programs will continue to be the main influence on agricultural development. The principal crop-oriented government agencies either manage farming operations directly or hold responsibility for overall agricultural development and extension services in the area where their major crops are grown.

SODESUCRE, PALMINDUSTRIE, and SODEFEL are the most important equipment buyers. SODESUCRE, probably the largest single purchaser, manages six irrigated sugar plantations with a total of 20,000 ha harvested in 1980. Equipment stock includes about 300 tractors, two-thirds of them over 80 hp. Spare parts shortages plague the organization, however, idling as much as 70-80 percent of equipment at a time. PALMINDUSTRIE, with a staff of 13,000, is responsible for managing plantations covering 51,000 ha of oil palm and 20,000 ha of coconuts as well as for marketing the output from 40,000 ha of smallholder plantings. Development of fruit and vegetable production is the responsibility of SODEFEL, which prepares land, handles machinery purchases, and provides management and technical support for cooperatives. The company owns about 7 tractors of 65-100 hp and related implements, as well as smaller 25-45 hp tractors.

CIDT, SODEPALM, and SATMACI are charged with developing individual crops that dominate Ivory Coast's three main ecological zones: the northern savannah (CIDT), the subtropical coastal belt (SODEPALM), and the intermediate forest zone (SATMACI). CIDT, which focuses on cotton, is jointly owned by the State (55 percent) and the French textile company CFDT. Development efforts have been oriented to bringing new land into cultivation and applying animal power to cotton and rice crops. A project to mechanize production with conventional tractor-drawn equipment failed, and CIDT has since launched a pilot program to introduce French Bouyer tractors for use by individuals or carefully selected groups of four or five farmers. CIDT also provides subsidized rice harvesting services and buys most of the 10,000 units of ULV spray equipment sold annually.

SATMACI, entirely state-owned, provides extension services to about one-third of the areas where coffee and cocoa grow. Its annual equipment requirements consist of some 4,500 motorized knapsack sprayers for use mainly on cocoa, 3,500 knapsack sprayers for use on coffee and young cocoa trees, and 250-300 hand-operated dusters. In addition, SATMACI is developing a small area for coffee cultivation using motorized equipment and provides custom rice harvesting services. SODEPALM carries out similar activities in regions where farmers raise coconut and oil palm.

Among other government agencies, MOTOR-AGRI provides land clearing services to other development companies and agencies, primarily with large earthmoving equipment rather than farm tractors. Two organizations help shape Government buying decisions. COMACI, the Committee for Agricultural Mechanization, has an advisory role in equipment selection by state companies, and CIMA (the Ivoirian Center for Agricultural Mechanization) develops long-term agricultural mechanization strategy. CIMA is currently field testing small machinery (6-30 hp) to provide the basis for a mechanization strategy for the next (1986-1990) 5-year plan.

Large and medium-sized private farms and plantations.—Pineapple and banana growers with farms of 20-100 ha are the leading private sector buyers of agricultural equipment. Many of these farmers own tractors, disc harrows, sprayers, and fertilizer spreaders. Some of the larger growers purchase grading equipment and a few have even invested in sprinkler irrigation equipment.

Other private sector purchasers of agricultural equipment include small-scale custom operators in northwestern Ivory Coast and cooperatives. Cooperatives are well established in the south. For example, a group of 800 banana and pineapple growers based in Abidjan organizes aerial spraying for pest control. In addition, cooperatives are emerging in the savannah region to the north; some 150 have been organized. Trade sources regard them as promising potential customers for tractors, cultivation equipment, trailers, and processing equipment.

Livestock and poultry production.—Much of the livestock raised in Ivory Coast is grazed extensively. A government organization, SODEPRA, carries out the only intensive beef production in the country. SODEPRA manages a beef fattening unit (10,000 head a year), a 2,000 ha pasture seed farm, 3 ranches, 2 cattle breeding centers, and a program of pasture improvement and extension. Intensive hog production, primarily by AFRIPORC, accounts for about a third of the Ivory Coast's total pork output of 7,300 metric tons.

SIPRA leads Ivory Coast's thriving poultry industry. It supplies day-old chicks to producers, who later return their broilers or eggs to SIPRA for processing and marketing. These farmers must have at least 1,000 broilers or 500 layers to be eligible for SIPRA services. SIPRA employs the full range of poultry equipment in its operation and plans to produce its own feed in the future. Another major poultry producer, DOMAK, serves the Abidjan market.

Market Access Data

About 20 major distributors handle most of the agricultural equipment imported into the Ivory Coast. Some distributors handle farm machinery as part of a much broader product line, but companies specializing in agricultural equipment have the best reputations. Markups are set by the Government at 23 percent for tractors, 30 percent for other agricultural equipment, and 45 percent for spare parts.

Imports into Ivory Coast from outside the French franc area and the European Economic Community are subject to individual licensing. All imports with an f.o.b. value of more than CFA100,000 (about $400) require a declaration of intent to import (unless already covered by a license) and those worth more than CFA500,000 (roughly $2,000) are subject to a pre-shipment inspection. Imports are subject to a revenue duty, a customs duty, and a value added tax (VAT). Most of the agricultural equipment shipped from the U.S. is exempt from both duties and subject to the lowest possible VAT rate (10.5 percent). However, tractors are subject to customs duty; 5 percent (over 75 hp) or 15 percent (up to 75 hp). Agricultural machines for garden and sports ground use, such as lawnmowers, face a 15 percent revenue duty and a 23.5 percent VAT.

Additional Information

The project officer responsible for Country Market Surveys on Agricultural Machinery and Equipment—Ivory Coast is C. H. Watts.

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The Survey summarizes a 38-page research report prepared by Laurence Gould Consultants, Ltd., London, England, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in the Ivory Coast and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from:

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CMS

Country Market Survey

Telecommunications Equipment

Mexico

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Mexico's current economic crisis, which began in 1981, has slashed the market for telecommunications equipment to an estimated $334.9 million[1] in 1982, down from $494.2 million in 1981 (see table 1). With prudent economic management, a slow recovery could begin by 1985, bringing the 1987 market approximately back to the 1982 level. Sales of telecommunications equipment in 1987 are now projected at $340 million. After several years of rapid growth based on increasing oil revenues, falling world oil prices and the country's huge foreign debts combined to bring on a major collapse of the Mexican economy. The market would probably have declined even further in 1982 were it not for orders that had already been placed and were difficult to cancel.

Demand is expected to contract further in future years as planned major investment projects are canceled to preserve the country's scarce foreign exchange for debt service. In addition, massive expenditures during the oil-rich years created excess capacity, further dampening the expected market in most sectors for the next 2 or 3 years.

Competitive Environment

Mexican companies furnish the bulk of the country's telecommunications equipment needs but depend largely on imported components. Sharp devaluation of the peso and rigid exchange controls brought imports to a virtual halt in the last quarter of 1982, causing total shipments to drop from $164.5 million in 1981 to $65 million in 1982. With continuing devaluations expected in the next few years, imports are forecast to shrink even further, declining to $63 million in 1987. Telephone and telegraph transmission equipment and mobile radio are foreseen as the principal import items.

U.S. firms, Mexico's major foreign suppliers, claimed 58 percent of imports in 1981 (see table 2). In 1982, the U.S. share decreased to 47 percent, mostly because U.S. suppliers furnished many emergency purchases made on short notice which were canceled more easily than the advance purchase agreements made with Japanese and European suppliers. By 1987 sales by U.S. concerns are predicted to decline to 45 percent of the import market, largely as a result of increased competition from lower cost Japanese-made equipment.

Cutbacks in supplies of imported components prompted a decline in domestic output from $332.2 million in 1981 to $270.3 million in 1982. Spurred by a buy-Mexican policy, however, local manufacturers expect to increase output at an average annual rate of 2.5 percent to about $305 million in 1987. Mexican firms mainly produce telephone, transmission, and mobile radio equipment. They supply little or no video and radio broadcasting, data communications, test and measurement, or satellite transmission equipment.

Three companies, each with 49 percent foreign participation, manufacture most of the domestic telephone equipment. Indetel (ITT), with 53 percent of the local market, employs 4,200 people; Teleindustrias Ericsson (Ericsson), with 35 percent of the local market, has 3,000 employees; and General de Telecommunicaciones (GTE) employs about 1,800 workers. These companies have a market advantage with Telefonos de Mexico (Telmex), the Mexican telephone company. Telmex has imported a great deal of equipment in the past few years, but much of it came from parent companies of local subsidiaries in which Telmex had some share.

Exports, which have fallen steadily from $15.9 million in 1979 to less than $1 million in 1982, are expected to be stressed under Mexico's economic recovery program and are predicted to reach $28 million in 1987. Companies with foreign ties tend to have the greatest advantage in obtaining technology and in exporting their products. Their edge is expected to increase in coming years as foreign exchange becomes more limited, for a company's ability to import foreign components will depend largely on its ability to export its end products. In 1981 most Mexican exports went to Central and South America, with the exception of mobile radios, which were assembled and sent to U.S. buyers, and $101,000 worth of telephone and telex equipment, which was manufactured by Ericsson and shipped to the parent company in Sweden (see table 3).

Shipments from U.S. factories, which plummeted from $86.7 million in 1981 to $28.2 million in 1982, are projected to settle at just under $25 million in 1987. Although the quality and technological superiority of U.S.-made equipment is recog-

Source: "The Mexican Market for Communications Equipment and Systems," Batres, Valdes, Wygard y Asociados, S.C., Avenida Revolucion 1209 Mexico 20, D.F., February 1983, prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box), and desk research.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=22.81 pesos (1979), 22.95 pesos (1980), 24.51 pesos (1981) and 65.86 pesos (1982 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1982 constant dollars.

Table 1.—Mexico: The market for telecommunications equipment, 1979-82 and projected 1987

(in thousands of U.S. dollars)

	1979	1980	1981	1982	Projected 1987
Telephone and telex equipment					
Local production	164,158	182,130	256,630	219,572	221,300
Imports	33,215	35,229	30,024	22,062	23,250
Exports (less)	2,124	795	551	564	10,000
Total	195,249	216,564	286,103	241,070	234,550
Transmission equipment					
Local production	42,162	49,500	56,500	36,805	64,750
Imports	18,353	25,539	46,908	14,113	9,900
Exports (less)	13,776	6,721	1,872	79	17,300
Total	46,739	68,318	101,536	50,839	57,350
Mobile radio					
Local production	6,500	7,250	14,100	9,976	11,330
Imports	5,030	9,168	6,452	2,530	900
Exports (less)	—	114	29	—	230
Total	11,530	16,304	20,523	12,506	12,000
Video and radio broadcasting equipment					
Local production	750	850	900	531	1,180
Imports	30,325	43,715	65,062	15,830	18,250
Exports (less)	—	—	—	—	—
Total	31,075	44,565	65,962	16,361	19,430
Data communications equipment					
Local production	250	375	560	440	2,260
Imports	4,200	6,300	9,500	6,693	5,650
Exports (less)	—	—	—	—	560
Total	4,450	6,675	10,060	7,133	7,350
Communications test and measurement equipment					
Local production	—	—	—	—	100
Imports	4,374	5,893	3,489	2,419	2,500
Exports (less)	—	—	—	—	—
Total	4,374	5,893	3,489	2,419	2,600
Satellite transmission equipment					
Local production	—	—	—	—	—
Imports	1,315	1,089	571	76	1,500
Exports (less)	—	—	—	—	—
Total	1,315	1,089	571	76	1,500
Services					
Local production	3,000	3,000	3,500	3,000	4,000
Imports	1,000	2,000	2,500	1,500	1,000
Exports (less)	—	—	—	—	—
Total	4,000	5,000	6,000	4,500	5,000
Total market					
Local production	216,820	243,105	332,190	270,324	304,920
Imports	97,812	128,933	164,506	65,223	62,950
Exports (less)	15,900	7,630	2,452	643	28,090
Total	298,732	364,408	494,244	334,904	339,780

Source: International Trade Administration, Office of Trade Information Services research study, "The Mexican Market for Communications Equipment and Systems" (see Additional Information box).

nized in Mexico, such European suppliers as Siemens (Germany), Ericsson, and the European ITT subsidiaries are too deeply entrenched in the public sector to be displaced by U.S. vendors. Manufacturers from the United States should concentrate instead on promoting lower priced equipment comparable to Japanese products.

The import market penetration of Japanese ven-

Table 2.—Mexico: Imports of telecommunications equipment by country of origin, 1979-82 and projected 1987
(in thousands of U.S. dollars)

	1979	1980	1981	1982	Projected 1987
Telephone and telex equipment					
United States	5,728	8,303	9,043	3,832	5,813
Sweden	13,021	11,003	1,004	6,977	
Japan	723	2,256	4,281	4,863	
France	5,173	2,308	5,640	1,234	
Germany	1,564	5,099	929	1,101	
Other	7,006	6,260	9,127	4,055	
Total	33,215	35,229	30,024	22,062	23,250
Transmission equipment					
United States	9,286	17,826	32,563	7,848	5,900
Japan	671	875	2,679	3,028	
France	4,824	3,915	3,454	1,295	
Germany	363	994	3,638	460	
Sweden	347	834	1,138	122	
Other	2,862	1,095	3,436	1,360	
Total	18,353	25,539	46,908	14,113	9,900
Mobile radio					
United States	3,860	6,099	4,381	2,243	540
Canada	213	723	20	127	
Japan	171	—	484	90	
Germany	525	964	1,424	65	
Italy	73	—	45	—	
France	172	917	—	—	
Other	16	465	98	5	
Total	5,030	9,168	6,452	2,530	900
Video and radio broadcasting equipment					
United States	19,215	26,713	39,253	12,571	10,950
Japan	4,073	8,079	14,334	2,438	
France	495	1,971	3,099	1,793	
Germany	2,773	1,744	2,609	213	
United Kingdom	2,066	1,397	259	69	
Other	1,703	3,811	5,508	1,368	
Total	30,325	43,715	65,062	18,452	18,250
Communications test and measurement equipment					
United States	2,666	3,262	1,493	1,691	1,625
Japan	302	256	319	324	
Germany	166	350	69	146	
France	38	250	31	44	
Other	52	66	17	44	
United Kingdom	225	342	141	170	
Total	3,449	4,526	2,070	2,419	2,500

Source: International Trade Administration, Office of Trade Information Services, research study, "The Mexican Market for Communications Equipment and Systems."

dors has risen from 7 percent in 1979 to 15 percent in 1981. That trend is expected to continue, particularly for test and measuring, video and radio broadcasting, and mobile radio equipment.

Product Market Profiles

Telephone and telex equipment.—The market for telephone and telex equipment, which reached a high of $286 million in 1981, is projected to drop to $235 million in 1987, somewhat greater than its 1980 level. Mexican plants now fabricate about 90 percent of all telephone and telex equipment; by 1987 this figure is predicted to reach 94 percent. U.S. vendors increased their share of imports in this product category from 17 percent in 1979 to more than 30 percent in 1981, mostly at the expense of Swedish suppliers. But imports plummeted in 1982, leaving U.S. firms again with a 17 percent share. By 1987, U.S. shipments are expected to reach $5.8 million worth for 25 percent of imports.

Telmex purchases all telephone equipment and closely controls subscriber/user premises equipment. The Direccion General de Telecomunicaciones (DGT), the Government's telecommunications authority, purchases all telex equipment. Both Telmex and the DGT have used their present suppliers for years and, with the present foreign exchange shortage, are expected to be even more closely tied to them. GT, Ericsson, and Indetel account for most of the domestically produced local office, subscriber/users premises, and other telephone and central office equipment.

Sales of telephone switches and switching systems are expected to shrink from $275.3 million to $188 million in the 1981-87 period (see table 4). Telmex has decided to convert to digital equipment, but implementation may be held up because of the current economic situation. More than 80 percent of toll office systems have fewer than 100 lines, and the rest have fewer than 1,000. About 90 percent of the systems are analog electromechanical, with the remainder largely digital.

Table 3.—Mexico: Exports of telecommunications equipment, 1980 and 1981

(in thousands of U.S. dollars)

	1980	1981
Telephone and telex equipment		
United States	49	3
Dominican Republic	93	275
Sweden	383	101
Chile	9	69
El Salvador	27	19
Other	173	81
Total	734	548
Transmission equipment		
United States	2,257	141
Costa Rica	—	864
Guatemala	2,264	851
Peru	—	3
Ecuador	—	1
Honduras	2,205	—
Other	—	—
Total	6,726	1,860
Mobile radio		
United States	114	28
Other	—	1
Total	114	29

Source: International Trade Administration, Office of Trade Information Services research study, "The Mexican Market for Communications Equipment and Systems."

Table 4.—Mexico: The market for telecommunications equipment and systems by product category, 1981 and projected 1987

(in millions of U.S. dollars)

	1981	Projected 1987
Telephone and telex equipment		
Switches and switching systems	243.08	187.6
Subscriber/user premises equipment	21.50	28.2
Other telephone and central office equipment	20.82	11.8
Telex, teleprinters, and ancillary equipment	.70	7.0
Category total	286.10	234.6
Transmission equipment		
Wire and cable	70.57	35.3
High-frequency radio	15.33	5.7
Microwave	11.98	11.5
Lightwave	1.62	2.0
Multiplexers	2.03	2.9
Category total	101.53	57.4
Mobile radio		
Land	6.16	4.8
Mobile telephones	3.08	.6
Marine	6.16	4.2
Paging systems	4.10	1.2
Air-ground	1.03	1.2
Category total	20.53	12.0
Video and radio broadcasting equipment		
Closed circuit television	29.70	5.8
Radio broadcast transmitters	3.30	1.9
Television broadcast transmitters	2.64	1.9
Antenna towers	6.60	1.6
Radio studio equipment	8.55	1.9
Video studio equipment	15.17	6.2
Category total	65.96	19.3
Data communications equipment		
Concentrators	1.51	1.0
Modems	2.25	1.7
Multiplexers	2.80	2.2
Data communications switching equipment	2.50	1.6
Other equipment	1.00	.9
Category total	10.06	7.4

Source: International Trade Administration, Office of Trade Information Services research study, "The Mexican Market for Communications Equipment and Systems."

Analog electronic equipment is taking a firm hold and may dominate the market for the next few years except in central exchanges where electromechanical equipment is still the norm, especially in the provinces and in rural areas.

The market for subscriber/user premises equipment is predicted to rise slightly from $24.3 million in 1981 to $28 million in 1987, the only telephone equipment category expected to show any growth. Almost all PBX systems manufactured in Mexico are analog, and electronic systems have gradually been replacing electromechanical equipment. Digital PBX's have been imported in the past few years from U.S. companies, and additional sales potential exists with large multiline PBX's. More than 90 percent of all PBX's sold include their own key systems. Mexican-made key system equipment tends to be low-capacity and electronic. Systems with more than seven lines are imported.

Telephone sets, which are all supplied locally, generally have rotary dials although a few pushbutton sets are now being manufactured. Indetel, which holds about 40 percent of the rotary telephone market, receives a certain amount of preference for government contracts because Telmex holds a large share of Indetel's locally-owned stock. Ericsson claims the remaining 60 percent of the market for rotary telephones and 10 percent of sales of coin-operated telephones. In the past few years Ericsson has been losing market shares in coin-operated telephones to GTE, which now has 85 percent of that market.

Facsimile equipment has been used by the police force, news agencies, and Petroleos Mexicanos (Pemex)—the agency that controls Mexico's oil resources, but has never really caught on, partly because atmospheric conditions in Mexico City, where its popularity would be greatest, do not favor its use. Facsimile machines are expected to become more attractive if industry and Government move toward decentralization. Imports of facsimile equipment have come from Philips (Netherlands), Toshiba (Japan), and Motorola (United States).

Subscriber protection equipment is often integrated in PBX's by the three main manufacturers. Locally manufactured equipment uses breakers purchased from the Mexican firms Cuttler Hammer and IUSA. Most recording and answering devices are imported directly by Ericsson, GTE, and Indetel and incorporated into their equipment. When such devices are bought separately, they are usually imported from Sony, Toshiba, and Hitachi (Japan) and from Seny (Taiwan). Automatic dialers that are purchased separately come mainly from Telefunken (Germany), and Hitachi.

GTE is a major manufacturer of fire protection equipment, breakers, thermo fuses, scramblers, automatic dialers, and recording and answering devices. Scramblers are also made by Industrial Electronica Mexicana. Call restrictors are provided by all three major companies, as well as by Protectolada. Long-term prospects for sales of U.S.-made slow scan video sets appear to be good. A number of additional companies (see list of suppliers) devote part of their production to telephone equipment.

Other telephone and central office equipment sales are projected to contract from $23.6 million in 1981 to just under $12 million in 1987. GTE, Ericsson, and Indetel assemble signaling equipment with approximately 60 percent imported parts. Outside plant cable accessories are 90 percent national, provided principally by Conductores Monterrey, Condumex, and Latincasa, GTE, Indetel, and Ericsson supply the noncable accessories, importing cable blocking materials, pressure pipes, and air dryers from the United States.

The market for telex and teleprinter equipment, dominated by the Siemens subsidiary, is expected to burgeon from $800,000 in 1981 to $7 million in 1987. Telex equipment currently produced in Mexico is limited to the Siemens T100 electromechanical teleprinter, but this unit is giving way to the electronic Siemens T1000 unit which the Mexican subsidiary is importing from its parent company. The move from electromechanical to electronic is proceeding quickly, with 3,000 new telex lines scheduled for installation in the 1983-85 period. In the market for switching equipment, also controlled by Siemens, the TWK9 and TWK2 electronic units dominate. Some imports of the Eltex II model have come from Plantronics (United States), and market researchers see high potential for further U.S.-firm participation in this segment.

Technical standards for telephone equipment are established by Telmex following CCITT norms, while the DGT specifies telex requirements. All products sold on the market to private users must be approved by Telmex or the DGT. Since the availability of lines is very limited, anything which might cause interference is not allowed. Signaling equipment and circuit conditioning equipment must meet CCITT-2 specifications. Alphabetic fonts used in telex must contain the full alphabet in Spanish and conform to such international standards as the five code unit and the number two alphabet.

Transmission equipment.—The Mexican market for transmission equipment, which declined by almost half from $101.5 million in 1981 to $50.8 million in 1982, is projected to reach $57 million by 1987. The domestic share rose from about 56 percent of sales in 1981 to more than 72 percent in 1982 and in 1987 is expected to strengthen its dominant position in this segment.

United States vendors claimed more than two-thirds of transmission equipment imports in 1980

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Telephone and Telex equipment		
Conductores Monterrey	Mexico	Scramblers
Condutel	Mexico	Telephone cable
Cuttler Hammer	Mexico	Circuit breakers, starters, and control equipment
Ericsson	Mexico	Telephone switches and switching systems, subscriber/user premises equipment, other telephone and central office equipment
GTE	Mexico	Telephone switches and switching systems, subscribers/user premises equipment, coin-operated telephones, PBX switches and switching equipment, fire protection equipment, breakers and thermo fuses, scramblers
Indetel	Mexico	Telephone switches and switching systems, subscribers/user premises equipment, other telephone and central office equipment
Industria Telecomunicaciones	Mexico	Scramblers
Industrias Electronica	Mexico	Scramblers
Latincasa	Mexico	Wire and cable
Protectolada	Mexico	Scramblers
Siemens	Mexico	Telex systems
GTE	United States	Scramblers, slow scan video sets
Motorola	United States	Facsimile equipment, slow scan video sets
Akai	Japan	Scramblers
Ericsson	Sweden	Scramblers
Hitachi	Japan	Recording and answering devices, automatic dialers
ITT	France	Scramblers
National	Japan	Slow scan video sets
Philips	Netherlands	Facsimile equipment, slow scan video sets
Seny	Taiwan	Recording and answering device
Sony	Japan	Recording and answering devices, slow scan video sets
Telefunken	Germany	Automatic dialers, slow scan video sets
Toshiba	Japan	Facsimile equipment, recording and answering devices
Transmission equipment		
Componentes Electronicos	Mexico	Hf radio
Conductores Guadalajara	Mexico	Coaxial cable, hf radio
Conductores Monterrey	Mexico	Wire and cable, coaxial cable hf radio
Condumex	Mexico	Wire and cable, coaxial cable(hf radio
FESA	Mexico	Wave guide carriers
Indetel	Mexico	Carrier trunks
Industria Electronica	Mexico	Hr radio
Industrias Sintronic	Mexico	Hf radio
Latincasa	Mexico	Wire and cable
Sistemas y Componentes Mexicanos	Mexico	TDM's
Telextra (GTE)	Mexico	Carrier trunks
Telefonos de Mexico	Mexico	Wave guide carriers
Cobra	United States	Hf radio
Collins	United States	Microwave equipment
GTE	United States	Microwave equipment, antennas, carrier trunks
General Electric	United States	Microwave equipment
IUSA	United States	Protection switch-gear
Motorola	United States	Hf radio
Simplex	United States	Coaxial cable
Skyline	United States	Hf radio

Leading Suppliers—(continued)

Name	Country(ies) of Manufacture	Type of Equipment
Westinghouse	United States	Hf radio
Cuttler Hammer		Protection switch-gear
Ericsson	Sweden	Multiplexers
ITT		Multiplexers
National	Japan	Hf radio
NEC	Japan	Microwave equipment, antennas
Philips	Netherlands	Hf radio, multiplexers
Standard Elektrik Lorenz	Germany	Antennas
Telektra	Italy	Microwave equipment
Mobile radio		
Alba	Mexico	Marine radios
Macromex	Mexico	Radios of less than 45 W, FM single-band, marine radios
Bendix	United States	Ground installations for air-ground communication
Cobra	United States	Mobile radios
Collins	United States	Ground installations for air-ground communication
General Electric	United States	Mobile radios, paging systems
Motorola	United States	Mobile radios, mobile telephones, paging systems, ground installations, for air-ground communication
National	Japan	Mobile radios, mobile telephones
NEC	Japan	Mobile telephones, paging systems
Philips	Netherlands	Mobile radios
Sony	Japan	Mobile radios
Video and audio broadcasting		
Arquimetalica	Mexico	Antenna towers
Eyesa	Mexico	Antenna towers
FESA	Mexico	Antenna towers
GTE	Mexico	Antennas, transmission lines
Techos y Estructuras	Mexico	Antenna towers
Admiral	United States	Receivers
Dynair Electronics	United States	CCTV
General Electric	United States	Receivers, scan converters, TV transmitters, antennas, transmission lines, radio studio equipment
Motorola	United States	Radio broadcasting equipment, monitors
RCA Victor	United States	Radio broadcasting equipment, video studio equipment, monitors, TV transmitters
Westinghouse	United States	TV transmitters, antennas, transmission lines
Hitachi	Japan	Monitors, video studio equipment
National	Japan	Radio broadcasting equipment, CCTV, receivers, scan converters
NEC	Japan	CCTV, antennas, transmission lines
Philips	Netherlands	CCTV, TV transmitters, video studio equipment
Sony	Japan	CCTV, monitors, radio and video studio equipment
Telefunken	Germany	Video studio equipment
Toshiba	Japan	Monitors, radio and video studio equipment
Data communications		
GTE	Mexico	Modems
Syscom	Mexico	Modems, multiplexers
Transdata	Mexico	Modems, multiplexers
Codex	United States	Concentrators, modems, multiplexers, switching equipment
GDC	United States	Concentrators, multiplexers, switching equipment
ITT	United States	Modems
Infoton	United States	Multiplexers
Micom	United States	Concentrators
Norfield	United States	Switching equipment
Paradyne	United States	Modems
Communications test and measurement equipment		
Comex	United States	Telegraph signal test sets

Leading Suppliers—(continued)

Name	Country(ies) of Manufacture	Type of Equipment
Hewlett Packard	United States	Analog line, selective level transmission sets, transmission characteristics testers, spectrum analyzers, sandard signal generators (less than 1 GHz), equalization and coil loading measurements, oscilloscopes and chart recorders, telegraph signal test sets, bit error performance testers, PCM system analyzers, data monitors, simulators
Muirhead Addison	United States	Cable loss characteristics measurement
Polarand	United States	Analog line, selective level transmission sets, spectrum analyzers, microwave sweep generators, frequency response analyzers
RCA Victor	United States	Transmission characteristics tests, spectrum analyzers, simulators
Rolm	United States	PCM system analyzers
Systron	United States	Spectrum analyzers, microwave sweep generators, bit error performance testers
Tectronics	United States	Data monitors
Tectronix	United States	Standard signal generators (less than 1 GHz), frequency response analyzers
Telesco International	United States	Interface testers
Texscan	United States	Analog line, selective level transmission sets, transmission characteristics testers, white noise test sets (FEM), spectrum analyzers, standard signal generators (less than 1 GHz), microwave sweep generators, equalization and coil loading measurements, oscilloscopes and chart recorders, frequency response analyzers, cable loss characteristics measurement
Tri-tronics	United States	Telegraph signal test sets
Wabatek	United States	Microwave sweep generators
Yew	United States	Telegraph signal test sets, white noise test sets (FEM)
Akai	Japan	Analog line, selective level transmission sets, spectrum analyzers, oscilloscopes and chart recorders
Gossen	Germany	Data monitors
NEC	Japan	TV wave for monitoring
Philips	Netherlands	Analog line, selective level transmission sets, oscilloscopes and chart recorders
Rolhm	Germany	TV wave for monitoring
Telectronics	Japan	White noise test sets (FEM), spectrum analyzers, standard signal generators (less than 1 GHz), equalization and coil loading measurements
TMK	Japan	Telegraph signal test sets
Yokagawa	Japan	Bit error performance testers

and 1981, only to drop to 56 percent in 1982 when imports were sharply curtailed. Suppliers from the United States anticipate building back up to almost 60 percent of imports by 1987. In the present economic situation, sales potential for U.S. vendors exists only with selected products, specifically carrier trunks, hf radio, microwave equipment, and multiplexers. U.S. manufacturers may benefit from the DGT's announced plans to spend $174 million during the 1983-85 period to construct 576 microwave repeater stations, 3,000 additional telex lines, and a satellite earth station.

Telmex and the DGT are the main purchasers of transmission equipment other than hf radio, and Telmex holds 75-80 percent of land microwave communications under DGT supervision. The Government has traditionally encouraged local production with promises of guaranteed equipment purchases, but this policy was altered in the past few years to try to bring Mexico up to date with the most sophisticated equipment. The current foreign exchange shortage is expected to push government agencies back to reliance on local manufacturers.

Wire and cable sales are predicted to fall dramatically from $70.6 million in 1981 to slightly more than $35 million in 1987. Approximately 60 percent of metallic trunks, mainly trunk circuits, are imported by GTE, Indetel, and Ericsson from their parent companies and subsidiaries abroad. GTE also imports most carrier trunks, which are usually short haul. About 40 percent of the coaxial cable is imported, mainly from Simplex (United States), while 60 percent is supplied by the local companies Condumex, Conductores Monterrey, and Conductores Guadalajara, which also provide exchange paired cable, inside wiring, and switchboard wiring.

A sharp reduction from $15.3 million to just under $6 million is anticipated in the market for hf radio. Hf radio is purchased by Pemex, the Federal District Government, the social security hospitals, the Federal Electricity Commission, and the Water Resources Secretariat, which have been importing their equipment directly but are now expected to buy it locally. Construction companies are the major private purchasers of hf radio.

Some 80 percent of hf radio is imported from Philips, National (Japan), and Skyline, Motorola, Westinghouse, and Cobra (U.S. suppliers). The other 20 percent is assembled locally with a significant portion of imported components by Industrias Sintronic, Industria Electronica, Industria de Radio Comunicaciones, and others. The local suppliers make single side band equipment for 3 to 16 kHz and some very high frequency (vhf), but most of the local products show poor quality compared with imported goods. Further movement toward use of ultrahigh frequency (uhf) is expected.

Microwave equipment sales are expected to remain fairly steady in the $11 million range, supplied by NEC (Japan), Telextra (GTE-Italy), and GTE, GE, and Collins (United States). In the past few years purchasers gravitated toward European suppliers, but recently U.S. equipment has again begun to dominate the market, although Germany's Standard Elektrik Lorenz still provides some items. Most of the equipment is short or intermediate haul because of Mexico's topography. Antennas and protection switching equipment are typically purchased as part of a system. Antennas bought separately usually come from Lorenz, NEC, and GTE, which supply 80 percent of Mexico's transmission lines as well. Wave guides also come as part of the microwave package, supplied mainly by Andrew (United States) and Telefunken. Some digital microwave equipment is used, mainly from GTE, but analog predominates. The authorities are trying to cover the country's requirements fully before spending money to improve existing facilities. An eventual changeover to digital equipment is expected, however.

Lightwave systems, although not in general use, are predicted to show some market growth, reaching $2 million in 1987 sales. Four lightwave systems were installed in the Mexico City telephone trunk system on an experimental basis in 1981-82 but further installation is likely to be delayed for lack of funds.

Multiplexer sales are projected to expand from $2 million in 1981 to almost $3 million in 1987. Time-division multiplexers (TDM) are supplied locally by Sistemas y Componentes and GTE. Imported TDM's come from Siemens, ITT, GTE, and Ericsson. Pulse-code modulation (PCM) multiplexers are all imported from ITT, Philips, and Ericsson. No frequency-division multiplexers are used in Mexico.

Standards for transmission equipment are fixed by the DGT and Telmex. Long-distance transmission frequency bands used are 4 to 8 kHz. Vhf/FM radio runs on a 148-178 MHz, and uhf runs at 450-512 MHz. Because of saturation problems, a move is expected toward uhf bands in the 415-512 MHz range. Communications in the valley of Mexico are mainly FM because of the interference on AM. Hf radio equipment is largely 100-150 W. Present microwave equipment uses 120-960 channels.

Mobile radio.—Sales in the mobile radio segment, which contracted sharply from $20.5 million in 1981 to $12.5 million in 1982, are projected to stay at the $12 million level through 1987. U.S. companies have dominated mobile radio imports, claiming about two-thirds of the market in 1980 and 1981. Shipments from the United States are expected to decline substantially to about $540,000 in 1987 but would still account for 60 percent of imports. Paging systems, conventional mobile radio, and marine radio appear to have the best sales potential for U.S. vendors. Paging systems are of special interest in the large metropolitan areas, and new investments in marine radio are needed to update Mexico's fleets. Increased use of vehicular mobile radio by government departments and private groups is expected, with special demand for components to be used in local assembly. U.S. firms with subsidiaries in Mexico have a good image, even though Japanese radio is considered less expensive than its U.S. equivalent. Companies with local operations are favored in mobile radio purchases because of service and the supply of parts.

Sales of land mobile radios, more than $6 million in 1981, are forecast to contract 22 percent to less than $5 million in 1987. The major purchasers of conventional mobile radio include police forces, the Red Cross, the social security services, the Mexico City government, Pemex, the Secretariat of Communications and Transport, Telmex, CFE, and private construction companies.

Most conventional mobile radio units bought in Mexico are 45-W, single band uhf/FM units for vehicular use. They are assembled by the local subsidiaries of Philips, GE, and National using imported parts. Small conventional units are also manufactured domestically by Macromex and Industrias Sintronic. All vhf units and all radios over 50 W are imported, largely from Sony, National, GE, Cobra, Motorola, and Philips. The Japanese are successfully penetrating this market with cheaper equipment, but radio units integrated into other equipment are still largely of U.S. origin.

Mobile telephone sales are expected to plummet from over $3 million to just $600,000 in the 1981-87 period since all units are imported. Used principally by high government officials and private sector executives, mobile telephones are supplied by Motorola, NEC, and National.

The 1987 market for paging systems is projected at $1.2 million, only a fraction of its $4.1 million 1981 level. Purchased mainly by industrial maintenance service companies, large sales departments, and the medical profession, paging systems are all imported, coming primarily from Motorola, GE, and NEC. Systems for both tone, and tone and voice, are used, although tone and voice is preferred to avoid interference.

The market for marine radio is also expected to contract substantially to just over $4 million in 1987. Low wattage, low frequency marine radio for coastal shipping is provided by two local companies, Macromex and Alba. Deep-sea fishing boats use imported radios from Italy's Marconi and Japan's Furuno, Hitachi, and National. Ibercommunication, a Spanish subsidiary of Philips, has integrated its radio into new tuna and shrimp boats sold by Spain to Mexico. Most marine radio is single side band, 2 to 4 megacycles, with up to 22 megacycles for tuna boats, and is purchased by the Marine Secretariat, the Tuna and Shrimp Cooperative, and Transportes Mexicanos.

Air-ground radio sales are forecast to pick up slightly from their 1981 level of $1 million, reaching $1.2 million in 1987. Air-ground communications equipment, purchased only by the DGT, is vhf, FM, 110-179 MHz, and has generally become part of a full package in the sale of base stations. The installations are imported, mainly from U.S. companies including Collins, Bendix, and Motorola Aerospace.

Technical standards for mobile radio are established by the DGT following international norms. All systems must be conventional because cellular equipment is not permitted by the Mexican authorities.

Video and radio broadcasting equipment.—The market for video and radio broadcasting equipment, which is supplied almost entirely by imports, fell from almost $66 million in 1981 to just over $16 million in 1982. By 1987 it is expected to improve only slightly to $19 million.

U.S. firms are the major foreign suppliers, claiming slightly more than 60 percent of imports in 1980 and 1981, a share that grew to 68 percent in 1982 when Japanese shipments fell sharply. By 1987, sales by U.S. firms are expected to total almost $11 million, again accounting for 60 percent of imports. Television broadcast transmitters are expected to have the best sales outlook, given the Government's promotion of education through television. Other products with high sales potential include tape recorders and video studio equipment, especially mobile cameras, video amplifiers, and TV standards converters.

A precipitous drop is forecast in the market for closed circuit television (CCTV), from $29.7 million in 1981 to under $6 million in 1987. CCTV equipment is purchased by Pemex, banks, hospitals, and other government departments. Private companies had started to buy CCTV before the economic crisis but are unlikely to do so now.

These systems are all imported, with U.S.-made equipment dominating the field. Dynair Electronics supplies package systems, with competition from NEC, National, Sony, and Philips. A number of companies provide separately purchased items, including RCA, Motorola, Sony, Hitachi, and Toshiba (monitors); Admiral (receivers); GE (receivers and scan converters); National (receivers, scan converters, and control consoles); and Consolet Video Systems and Monitor (control consoles).

Sales of new radio and TV broadcast transmitters in 1987 are each expected to fall to under $2 million from their 1981 totals of $3.3 million and $2.6 million, respectively. Radio broadcasting equipment is bought by both government and privately owned stations. Television broadcasting equipment is purchased by the privately owned Telesistema Mexicano, by the Government's Corporacion Mexicana de Radio y Television, and by the National Polytechnic Institute, which also has a station. Pressed by current economic crisis, many radio and TV stations expect to resort to using secondhand U.S. equipment, especially in the provinces and rural areas.

Most of the older AM and FM radio broadcast transmitters came from RCA Victor, with some imports from other American and Japanese firms. Recent 250-W FM transmitter imports, with stereo and FPA generators, have come principally from RCA, Motorola, and NEC. Television broadcast transmitters (vhf) are imported mainly from American suppliers including GE, RCA, and Westinghouse. Philips is also a major vendor, and National is testing a uhf transmitter. Antennas and transmission lines are supplied by Westinghouse, GE, NEC, and, to some extent, by General Data Corporation (GDC) in Mexico.

Sales of antenna towers, which are made locally by FESA, Arquimetalica, Techos y Estructuras, and Eyesa, are predicted to plunge from $6.6 million in 1981 to only $1.6 million in 1987. Radio studio equipment, with a 1987 market anticipated at just under $2 million, down from 1981 sales of $8.5 million, is all imported. GE, RCA, Sony, National, Toshiba, and Neki (Japan) supply consoles which normally include recording and playback equipment. Separate pieces of equipment are also shipped by several U.S. and Japanese companies.

Sales of video studio equipment are forecast to fall to $6.2 million in 1987, from a 1981 level of over $15 million. Such equipment has been shipped mainly by RCA, Telefunken, Philips, Sony, Toshiba, and Hitachi. Some camera pedestals are made locally by Ransom Mexicana. Video cassette equipment is replacing the use of mobile vans, which are considered too highly priced.

TV and radio standards are set by the DGT; no specific standards and regulations have been set for CCTV. Imported broadcast equipment, if it conforms to international norms, requires no modification for use in Mexico.

Data communications equipment.—Sales of data communications equipment, which has increased steadily from $4.5 million in 1979 to over $10.1 million in 1981, declined to just over $7 million in 1982 and are projected to stay at that level in 1987. Imports have supplied almost the entire market until now but, by 1987, local production is predicted to reach $2.3 million, or about 31 percent of the market. Mexican-made data transmission equipment compares well technologically with U.S.-made products, as all the local manufacturers are either subsidiaries or licensees of U.S. corporations. U.S. sales prospects for modems and multiplexers have remained strong in the face of massive peso devaluations; demand far exceeds domestic production of modems, and future increased use of CPU's will require multiplexers.

Banks and large government agencies like Pemex, the Federal Electricity Commission, and the Federal government departments are the main purchasers of data communications equipment. Both public and private end-users rely on their mainframe suppliers and on outside consultants specializing in data transmission network design for advice in choosing equipment suppliers.

Trade sources anticipate a falloff in sales of concentrators from $1.5 million in 1981 to $1 million in 1987. Imports, which represent the entire market, are dominated by U.S. suppliers such as Micom, Codex, and GDC. The 1987 market for modems is forecast at $1.7 million, down from $2.3 million in 1981. Local manufacture has grown significantly, with Syscom, GDC, and Transdata covering a range up to 2,400 bauds and possibly to 9,200 bauds if demand warrants. Imported modems, mostly between 300 and 9,600 bauds, are supplied by such U.S. firms as Codex, ITT, and Paradyne. European and Japanese brands are also making more inroads in the market.

A moderate decline is predicted in the market for multiplexers, from $2.8 million in 1981 to $2.2 million in 1987. Syscom and Transdata produce multiplexers locally but imports from U.S. companies, among them Infoton, GDC, and Codex, continue to be significant. Sales of data communications switching equipment in 1987 are projected at $1.6 million, down from $2.5 million in 1981. Transdata has started production of switching equipment with units from eight ports, which can be installed in tandem to increase capacity in multiples of eight, but imports, principally from such U.S. suppliers as GDC, Codex, and Norfield, still account for the bulk of sales.

Demand for other data communications equipment is expected to remain stable in the 1981-87 period. Line drivers are imported from United Data

Services (UDS), Micom, and GDC, and are also made locally by Transdata. "Ethernet type" systems, using equipment from Ungermann Bass (United States), have had some success in Mexico. Given the diversity of the brands of computers now in use, these local data networks which make computers compatible may also have good sales prospects.

Technical standards for data transmission are issued by the DGT. Transmission speds range between 300 and 9,600 bauds per minute, with 1,200 and 2,400 bauds being the most common. The use of automatic couplers is prohibited.

Communications test and measuring equipment.—Sales of communications test and measuring equipment began dropping even before the onset of the nation's economic difficulties. From a high of $5.9 million in 1980, the market dropped to $3.5 million in 1981 and fell further to $2.4 million in 1982. Sales in 1987 are projected at $2.6 million, with considerable growth predicted for digital and PCM equipment and major cutbacks seen in all other items. All equipment has been imported to date, and only a negligible amount of local production is expected for 1987.

U.S.-made products, which have dropped from 77 percent of imports in 1979 to about 70 percent in 1982, should still dominate, accounting for approximately 65 percent of imports in 1987. Users willingly pay more for U.S.-made equipment because they feel it is more reliable, easier to service, and more oriented to locally-used technology than the products of other nations.

Analog equipment showing sales potential for U.S. firms includes spectrum analyzers, which are purchased by CCTV owners, TV stations, and Telmex; selective level transmission sets, for which the DGT and electronics laboratories are the major buyers; frequency response analyzers, used mainly by the Secretariat of Communications, Telmex, and TV stations; and oscilloscopes and chart recorders, used by all sectors. Digital and PCM interface testers and simulators are also expected to be in demand. Analog equipment is supplied by Akai and Telectronics of Japan, Philips, and a number of U.S. companies, including Texscan, Polarand, Hewlett Packard, RCA Victor, Tectronix, and Systron.

Most users are moving toward digital test instruments because of their relative simplicity. Digital and PCM equipment is purchased mostly from U.S. vendors. Major U.S. suppliers include Tri-tronics, Comex, Yew, Hewlett Packard, Telesco International, Systron, Rolm, and Tectronics, Japan's TMK ships telegraph signal test sets, and Yokagawa supplies bit error performance testers. Gossen (Germany) provides data monitors.

Satellite transmission equipment.—Strong growth is expected in the market for satellite transmission equipment, with 1987 sales reaching $1.5 million. Demand had approached this level in 1979 when sales topped $1.3 million but had dropped steadily since then to only $76,000 in 1982. Imports supply the entire market. Mexico had planned to launch its own satellite by 1985 but, under the present economic conditions, that plan has been postponed indefinitely.

The country now has three Intelsat general stations, valued at $11.5 million, and 227 land domestic and regional stations valued at about $25,000 each. Twenty additional repeater stations are programed for 1983, and another Intelsat general station is scheduled to be set up near the Pacific Coast in the 1983-85 period.

In the short term, the private sector is not expected to use scarce resources on any additional earth stations. State governments, however, are expected to enter this market in the next few years. For the longer term, joint private/public investments are more likely, always under the overall control of the DGT.

Services.—The market for communications planning and consulting services, which fell from $6 million in 1981 to $4.5 million in 1982, is predicted to rise somewhat to $5 million in 1987, but with a shift to local consultants. Services were imported at a growing rate in the past few years when the peso was overvalued and oil income prompted plans for large new projects and expansion of existing networks. Installation and network planning and management accounted for almost three-quarters of expenditures on services. Some of the imported services (from Sweden, the United States, and Japan) were provided by personnel from the equipment suppliers and some by independent consulting firms. With the devaluation of the peso and the imposition of a 21-percent tax on foreign services to local clients, local consulting firms are expected to take over the market for all but the most specialized services.

End-User Profiles

Telmex accounts for about 70 percent of all purchases of telecommunications equipment (see table 5), with the DGT, police departments, banks and insurance companies, and the oil industry major users as well. The fishing industry, while still a prominent end-user, is forecast to slide by 1987 from third place to sixth in use, while banking and insurance will become more important.

Telecommunications authority.—Telecommunications in Mexico comes under the Secretariat of

Table 5.—Mexico: The market for telecommunications equipment by major end-user sector, 1981 and projected 1987

(in thousands of U.S. dollars)

	No. of firms 1981	1981	Projected 1987
Telephone companies	128[1]	322,200	237,000
Other telecommunications authority	1	44,500	39,880
Broadcast	527	9,900	4,000
Police	80	29,650	20,400
Air and harbor authorities	4	1,500	1,700
Public utilities	2	3,950	1,750
Petroleum	1	24,700	10,200
Hospitals	4,200	492	350
Other government	11	3,000	1,700
Transportation	760	1,500	1,000
Fishing	425	34,600	3,500
Retailing[2]	38	500	300
Banking and insurance	225	14,800	17,000
Others[3]	270	2,950	1,000
Total		494,242	339,780

[1] All these 128 companies are Telmex subsidiaries purchasing through Telmex.

[2] An estimated 38 companies are potential or current users of telecommunications equipment.

[3] Includes other smaller users such as sugar mill, construction companies, independent professionals, mining.

Source: International Trade Administration, Office of Trade Information Services, research study, "The Mexican Market for Communications Equipment and Systems."

Table 6.—Mexico: National telecommunications network, 1980-81

	1980	1981
Population	69,737,000	71,690,000
GNP (millions of U.S. dollars)	114,936	124,132
Number of telephones (thousands)	4,992	5,411
Rotary	4,958	5,357
Pushbutton	34	55
Business (includes government)	1,951	N/A
Residential	3,041	N/A
Mainstations	3,850	4,173
Public coin-box telephones	28	30
Mainstation waiting list	190	200
Number of key stations	1,900	1,600
Number of PBX's	300	450
Analog	292	441
Digital	8	9
Number of lines (thousands)	2,700	2,912
Number of exchanges	806	1,096
Manual/electromechanical	691	865
Analog electronic	114	230
Digital electronic	1	1
Number of telephone calls (millions)	10,755	11,506
Toll	416	442
Operator-assisted	N/A	N/A
Automatic	N/A	N/A
International	26	33
Operator-assisted	N/A	N/A
Automatic		
Number of telex subscriber lines switches	9,909	12,155
PTT (telecommunications only).		
Total employees	50,293	53,215
Total revenues (millions of U.S. dollars)	1,081.7	1,454.2
From telephone	929.1	1,289.4
From telex	45.8	50.9
From leased lines	106.8	113.9
Value of capital equipment (Telmex only, DGT N/A)		
In place	3,500	4,297
Purchased that year	620	797
Total budget (DGT)	1,388	1,934
Expenditures by Telmex (millions of U.S. dollars)		
Automatic and manual exchanges	201.1	213.2
Telephone and PBX	23.0	36.4
External installations for local services	118.4	163.4
Installations of lines and equipment for long-distance	67.0	84.0
Land and buildings	34.0	53.5
Other equipment	12.2	20.9
Total	455.7	583.5

Source: International Trade Administration, Office of Trade Information Services, research study, "The Mexican Market for Communications Equipment and Systems."

Communications and Transport. The DGT has overall responsibility for telegraph, satellite, microwave, telex, and radio communications, as well as some 10-15 private government telephone networks. The department is funded through the Secretariat's budget and loans from such institutions as the World Bank and Eximbank. The 1983-85 budget from the central Government is a proposed $174 million to cover satellite, microwave, and telex communications. Income from telex, telephone, TV, and radio communications permits and fees, $75.3 million in 1982, goes directly to the Secretariat. In 1982, the DGT spent an estimated $44.5 million on equipment, including $11.9 million on radio linkage, $7.7 million on microwave, $7 million on telex centrals, and $5.2 million on transmission (see table 6).

The DGT controls telephone service through Telmex, which is organized into four directorates: Expansion and Supply, Finance and Administration, Service to Clients, and Planning. Purchasing is done by the Expansion and Supply directorate, which is also in charge of operations and the microwave network.

Telmex owns 128 telephone companies with total 1981 employment of 29,566 persons. It is financed with shares and obligations sold on the stock exchange as well as special AA shares sold to the Government, which gives the company 40 percent of the revenue from telephone taxes in return for 51 percent ownership of Telmex stock. In addition, all new telephone subscribers must invest in Telmex shares, and the company also obtains income from its investments in Indetel, Ericsson, and other companies.

In 1982, Telmex built 3 new automatic exchanges and expanded 37 exchanges in Mexico City. In the provinces it built 41 new exchanges and expanded 143 others. Telephone lines now total 3,115,000 and reach almost 5,000 communities. The rural radio telephone (hf) program, which serves 717 rural communities, has grown 120 percent over the past 4 years. Mexico's telephone density is currently 7.6 telephones for every 100 persons. Given the economic climate, few new projects have been approved, but Telmex does intend to open up 355 new telephone lines covering 400 rural areas during the 1983-85 period; and, in conjunction with the DGT, it plans to set up 20 new microwave stations.

Technologically, Telmex has its own R&D section backed up by GTE, ITT, and Ericsson and sometimes by other U.S. companies like Bell Telephone. The company decided in 1980 to convert to digital technology, allowing Telmex to offer such new services as pushbutton dialing and teleconference calling.

The fast growth of TV signal transmissions has spurred the growth and modernization of the national telecommunications network. The system, which was installed in 1968, started to become saturated in the late 1970's, leading to the 1981-82 installation of solid state amplifiers in an effort to modernize most of the terminals and receivers. Also in 1981-82 a considerable portion of TV signal transmissions was diverted to satellite linkups, freeing the microwave network for the transmission of telephone signals. Nine State Governments have signed agreements with the Federal Government to install additional earth stations for TV reception so that television can reach all areas of the country in the next few years.

Telex communications cover 24 countries and 238 Mexican cities. Considerable progress has been made in converting from electromechanical to electronic exchanges. The telex network now consists of 4 electronic nodal exchange, 28 concentrators, and 52 electromechanical exchanges acting as concentrators, with further progress expected.

The DGT now controls all data transmission services, after cancelling several private concessions in 1980. The public network consists of three central exchanges in Guadalajara, Monterrey, and Mexico City, two concentrators in Hermosillo and Puebla, and multiplexers in seven other cities.

In late 1980, the DGT inaugurated the INFONET teleprocessing service, which is linked up with the Computer Sciences Corporation data processing center in Los Angeles through three access centers in Guadalajara, Monterrey, and Hermosillo. Since Pemex and other government and private organizations are interested in this service, several hundred new terminals and several new access sites are expected to be installed in the next few years in central and southeast Mexico, with substantial equipment requirements.

Banking.—Mexico's banks, which were nationalized in September 1982, are undergoing a major restructuring, making acquisitions of new equipment unlikely in the short term. Before nationalization, the banks invested in sophisticated communications equipment, including CCTV for security purposes, and planned to add data communications equipment. A new data transmission system was put into operation in late 1982 linking 12 national bank systems through a concentrator in Mexico City with Europe, the United States, Canada, the Far East, and several Latin American countries, using speeds of 2,400 bps for domestic and 9,600 bps for international communications. Expenditures reached $14.8 million in 1981 and, after the restructuring, are expected to grow again to $17 million in 1987.

The bank restructuring committee headed by the Ministry of Finance is expected to divide the banking system into nine major groups, possibly with each one overseeing the financing of a particular sector of the economy. Private participation of up to 34 percent is expected to be allowed in some form. The government sector includes five main banking end-users: Nacional Financiera, Banco Nacional de Obras y Servicios Publicos, Banco Nacional de Comercio Exterior, Banco Nacional de Credito Rural, and Financiera Nacional Azucarera.

Petroleum.—Pemex employed 125,000 permanent and 85,000 temporary workers in 1982, and boasts a broadcasting station, 1,500 paging systems, 36 marine radios, 1,000 CCTV systems, and eight data communications systems. The company invested $20-$30 million in base stations in the

1980-82 period and $10.5 million in mobile radio equipment in 1982. Expenditures for communications equipment in 1987 are projected at $10.2 million.

The company is expected to increase its mobile equipment purchases by 5-7 percent annually, and plans to add four data communications systems in 1983. Possible future projects include a new radio broadcasting system and new radio bases.

Video and radio broadcast.—The 527 firms in the video and radio broadcast industry, which employ some 25,000 people, are expected to invest $4 million in communications equipment in 1987, down from $9.9 million in 1981. The radio sector comprises 750 AM stations, 92 FM stations, and 25 short-wave stations. The television system includes 125 commercial and 25 cultural stations, mostly run by the Ministry of Public Education and by the office of radio, television, and cinematography.

Ten major end-users make up the broadcast sector: RCN (Radio Cadena Nacional), Telesistema Mexicano (Televisa), Instituto Politecnico Nacional, the Ministry of Education, Cablevision, Organizacion Radio Centro, Nucleo Radio Mil, Grupo ACIR. Corporacion Mexicana de Radio y Television, and Television del Norte.

No new radio projects have been proposed and the number of radio stations may even be reduced, but plans are underway to construct five new TV stations. The Ministry of Education is planning to decentralize education programs to the States and is hoping to expand the use of television for primary and secondary education.

Investments by the broadcast sector are expected to include video cameras, monitors, and video studio equipment, with the emphasis on economical easy-to-handle equipment, rather than state-of-the-art technology. Many radio and television stations bought the latest available equipment in the past few years. AM and FM radio broadcast transmitters tend to be less up-to-date and operate on low frequencies.

Fishing.—The fishing industry, formerly the third most important end-user of telecommunications equipment with investments worth $34.6 million in 1981, has curtailed its involvement dramatically, with 1987 allotments projected at only $3.5 million. Cooperative own 80 percent of all the fishing vessels in Mexico.

During the past few years, the Government created a Department of Fishing and a bank for the fishing industry to try to modernize the fishing sector. Shrimp fishing, a major foreign exchange earner, receives special attention. More than 800 new shrimp vessels have been launched in the past 3 years, all of them equipped with single side band 2-4 megacycle marine radio. Productos Pesqueros Mexicanos, a government organization, also plans to launch almost 100 vessels of over 20 tons in the next few years, all of them equipped with 22 megacycle transmission equipment.

Public utilities.—Mexico's two public utilities are predicted to apportion only $1.75 million to new equipment in 1987, a sharp drop from the 1981 level of about $4 million. The Federal Electricity Commission (CFE), which controls more than 90 percent of all electricity generation, employs 125,000 people.

CFE uses mainly vhf/FM conventional mobile radio for 800 units with 60 bases. The company also uses paging systems for maintenance and has 1,200 voice and tone repeaters in Mexico City, Monterrey, Guadalajara, Puebla, and Morelia. New radio stations and the use of some 100 mobile radios are planned in the Baja California area. The Commission also has an arrangement with the Secretariat of Communications and Transport to use its microwave equipment in Baja California and the northeast.

Other government.—Eleven other government agencies that use substantial amounts of telecommunications equipment anticipate expenditures of $1.7 million in 1987, down from $3 million in 1981. The largest of these is the Department of Education (Secretaria de Educacion Publica, or SEP) which produces junior high school and other educational courses that are broadcast nationally through the DGT microwave system. The program, which will probably be expanded because of its cost-effectiveness, uses mainly studio equipment, since its signal is delivered only to the DGT telecommunications tower in Mexico City. Most of the equipment has been purchased from U.S. and Japanese sources such as RCA, Toshiba, and JVC. Another SEP project, Radio Educacion, broadcasts cultural programs nationally through repeaters. Other government end-users include the Department of Agriculture and Water Resources, which purchases vhf/FM mobile radio, and the Department of Tourism, which operates 208 mobile units in its highway tourist assistance service.

Air and harbor authorities.—Equipment expenditures by Mexico's four air and harbor authorities are expected to increase somewhat, from $1.5 million in 1981 to $1.7 million in 1987. These authorities control 34 international airports, 32 domestic airports, 1,112 airstrips, and 82 ports, including 14 deep-sea ports.

The four purchasing authorites, Aeropuertos y Servicios Auxiliares (ASA), Direccion General de Aeronautica Civil, the Marine Secretariat, and

Puertos y Marina Mercante, allot funds to mobile radio, marine base stations, and air-ground communication systems. ASA has also invested in paging systems. Aeromexico and Mexicana airlines installed a data processing center in 1981 to do ticketing, reservations, scheduling, and flight planning. Investments of $120 million are projected for dredging and port operations in industrial ports. Nine new airports are planned and expansion is scheduled for six others, but official approval has not been received.

Transportation.—The transportation sector includes more than 750 firms with estimated expenditures of $1 million on communications equipment in 1987, a decline of one-third from the 1981 level of $1.5 million. The marine transportation sector, whose work force totals more than 15,500 individuals, uses mostly single side band marine radio. The national railways, which include Ferrocarriles Nacionales de Mexico, Ferrocarril del Pacifico, Ferrocarriles de Surestre, and Ferrocarril de Chihuahua al Pacifico, employed 97,400 persons in 1982 and use hf nonmobile single side band radio. The 27,600 vehicles in the trucking and bus companies mainly use single side band radio. Major transport companies includes Transportes Figueroa, Transportadora Nacional, and General Mexicana de Fletes.

Hospitals.—The 4,200 private and government hospitals in Mexico employed 28,000 workers in 1982 and had the services of 10,000 registered doctors. The hospital system allotted $492,000 to communications equipment in 1981, about 60 percent of it acquired by the social security system. Expenditures in 1987 are predicted to fall to $350,000, mainly for vhf/FM mobile radio, paging systems, and some special CCTV systems for medical use.

Hospitals are dominated by the Government through social security, the Government Employees Security (ISSTE), and the Ministry of Health and Assistance. Major private hospitals include the American British Cowdray Hospital, the Hospital Espanol, the Hospital Frances, the Hospital Metropolitano, and the Hospital Dalinde. The social security system plans to build 60 new hospitals and clinics over the next 3 years but private hospitals, facing heavier new taxes, are not anticipating expansion.

Other end-users.—Most of the 38 end-users in the retail sector are supermarket chains, which use a substantial amount of data transmission equipment such as modems, multiplexers, and switching equipment. This market is centralized in the Mexico City metropolitan area, where three major chains—Comercial Mexicana, Aurrera, and Gigante—own more than 60 self-service combination stores.

Mexico's 80 Federal, municipal, State, and Federal District police forces use about 18,000 mobile radio units and 60 bases. The major entities in this sector include: the Federal police (Ministry of Communication and Transport), the Mexico City police, the Monterrey police, the Guadalajara police, and the State Police forces.

Approximately 270 other end-users, including sugar mills, construction companies, independent professionals, and mining concerns, invested almost $3 million in communications equipment in 1981. Expenditures in 1987 are predicted to shrink to only $1 million.

Marketing Practices

Sales channels.—When demand for telecommunications equipment was high in Mexico, sales representatives virtually flooded the market. Conditions are changing, however, as the import market contracts. Local subsidiaries are becoming the most important marketing channels, enabling suppliers to provide Mexican-made or Mexican-assembled products to take the place of goods previously supplied from overseas. Sales through Mexican subsidiaries also facilitate at least partial payment in pesos, an important factor now that dollars are scarce.

Government tendering procedures require all sellers to be registered as approved suppliers with the Direccion General de Normas sobre Adquisiciones y Almacenes and the Office of the Secretaria de Comercio in Mexico City. Both local and foreign suppliers must be registered, but foreign companies need to provide only minimal information about their operations. Once registered as an approved supplier, a company can sell to all Federal agencies, although registration is also required at each purchasing office for sales to decentralized agencies such as Peme and the CFE. Nonregistered suppliers are occasionally invited to bid when their reputation or technology makes them eligible candidates or when the purchase qualifies as an emergency, although formal registration is required for any further sales.

All government purchases must now be put out to tender. Bids are submitted in two envelopes, one containing the technical proposal and the other containing the price bid. The technical proposals are evaluated first, a few are selected, and the commercial bids are then opened in public. Negotiations are carried out with the first place technical proposal bidder; only if these fail is a second bidder called to negotiate.

Telecommunications equipment advertising is limited. Telephone equipment suppliers buy ads more as a public relations activity than a promotional technique and, on a smaller scale, data communications suppliers advertise in trade journals. Large suppliers promote their equipment by inviting large government users to visit their plants or other users' facilities where their systems are installed. Smaller suppliers usually promote their equipment through leaflets or participation in local expositions. The only telecommunications equipment fairs held in Mexico are sponsored by the U.S. Department of Commerce through the U.S. Trade Center.

Financing.—In the current economy, price and payment terms are likely to be the most important basis of competition for foreign suppliers, superseding delivery dates, formerly the predominant factor. Government purchases typically have been paid for in cash or via international loans channeled through the Nacional Financiera (the National Development Bank). Now such official acquisitions will probably be regulated by a central authority like the Bank of Mexico, which would be charged with approving foreign exchange allocations among the various branches of the Government. Foreign financing of purchases hardly exists now, however, and leasing or rental arrangements remain the exception. Large end-users place little importance on aftersales service, except for very sophisticated equipment where supplier assistance is included in the purchase contract.

Trade Restrictions

Import duties on telecommunications equipment are fairly substantial, ranging from 10 percent for teleprinters and most types of radio telephone and radio telegraph transmitters and receivers, to 40 percent for coaxial cable and metal conductors, and 50 percent for various kinds of telephones. Tariffs of 15-30 percent are usual for radio and television broadcast equipment. Preferential rates of from 1 to 5 percent are charged on certain goods from Bolivia, Brazil, Ecuador, Paraguay, Argentina, and Uruguay. The Latin American Integration Association countries are exempt from tariffs on terminal boxes for teleprinters and pay 5 percent rather than 10 percent on mobile radio and nonmobile multiband radio.

Certain categories of equipment, mostly transmission equipment or other items usually purchased by government agencies, have access to the preferential, government-controlled rate of exchange, currently approximately 90 pesos to the dollar.

Import permits must be secured by Mexican purchasers for all goods prior to bringing the merchandise into the country. In addition, under the exchange control system, importers must obtain authorization to purchase dollars at the favorable controlled rate from one of the government-owned banks. Present plans seek to eliminate the controlled rate early in 1984.

Useful Addresses

Embassies

American Embassy
Commercial Section
Paseo de la Reforma 305
Mexico 5, D.F.
tf: 553-3333
tx: 017-73-091
Embassy of Mexico
2829 - 16th Street, N.W.
Washington, DC 20009
tf: 234-6000

Telecommunications administration

Direccion General de Telecomunicaciones
Departamento de Asuntos Internacionales
Torre Central de Telecomunicaciones
Avenida Lazaro Cardenas 567
Mexico 12, D.F.
Attn: Director General de Telecomunicaciones
tf: 519-68-61
tg: telecomex 41 mexico
tx: 1773980 daitme

PTT

Telefonos de Mexico S.A.
Apartado 50-815
Parque Via, 198
Mexico 5, D.F.
Attn: Coordinacion de la Informacion a Dependencies Officiales
tf: 518-8220
tg: telmex mexico
tx: 17 71233 telemex mex

Leased lines and data communications

Secretaria de Comunicaciones y Transportes
Direccion General de Telecomunicaciones
Avenida Lazaro Cardenas, No. 567
Mexico 12, D.F.
tf: 519-41-51
tx: 017-0960

Radio broadcasting

Camara Nacional de la Industria de Radio Y Television
Paseo de la Reforma 445
9 Piso
Mexico D.F.

Television broadcasting

Television Cultural de Mexico
Insurgentes Sur
Mexico D.F.

Televisa, S.A.
Edificio Televicentro
Chapultepec 18
Mexico 7, D.F.

Technical standards

Direccion General de Normas (DGN)
Tuxpan No 2
Mexico 7, D.F.
tf: 584-01-61
tg: sepafin-36
tx: 1775690 duiame

Mexico: Basic Economic Indicators

Population:	71.3 million (1982)
Area:	1,978,800 sq. km.
Administrative units:	31 States and the Federal District
GDP:	$239 billion (1981)
Contributions to GDP:	Services 49.8% (1982) Industry 35.6% (1982) Agriculture 8.1% (1982)
Inflation rate:	98.8% (1982)
Exports f.o.b.:	$21,006 million (1981)
U.S. share:	52% (1982)
Imports c.i.f.:	$15,041 million (1982)
U.S. share:	58% (1982)
Major trading partners:	United States, European Communities, Japan
Exchange rate:	70 pesos=US$1 (1982)
Fiscal year:	Calendar year
Current account balance:	−$4,175.8 million (1982)
International reserves:	$5,035.1 million (1981)
Federal budget	
revenues:	$58.1 billion (1980)
expenditures:	$66.9 billion (1980)
Labor force:	18 million (1978)
Unemployment:	12% (1982)
Average daily wage:	$5.00 (1983)

Additional Information

The project officer responsible for Country Market Surveys on telecommunications equipment is:

Hayden M. Wetzel
Market Research Division, Rm. 2012
International Trade Administration
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-4493

The Survey summarizes a 144-page research report prepared by Batres, Valdes, Wygard y Asociados, S.C., Mexico 20, D.F. under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Mexico and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey as well as the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230

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Marketing Information
Series

Guatemala

CMS/TCE/205/83; May 1983

CMS

Country Market Survey

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JUL 5 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Telecommunications Equipment

Guatemala

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Economic Overview

Guatemala's trade and economy are presently going through a rather difficult period. One of the country's chief current problems is the low level of international reserves; in September 1979 net reserves reached over $496 million[1] while in early 1982 net reserves were down to $40 million. This was caused, among other factors, by low prices for Guatemala's mainly agricultural exports, the serious decline of the Central American markets for Guatemala's manufactures, and transfers of capital abroad to take advantage of high rates of interest, where differentials have at times approached 100 percent.

The overthrow of the former regime on March 23, 1982, and its replacement by a Government with the declared intention to stamp out corruption, respect human rights, control the guerrilla movement, and revive the economy, has created an atmosphere of greater optimism about the future that may lead to a general improvement of business in the country. Guatemala is, nevertheless, suffering a severe imbalance in its foreign commerce at this time and, while the authorities are doing their best to correct and finance the resulting deficit, importers, manufacturers, and assemblers have been encountering delays of 3 to 6 months in obtaining foreign exchange at the Central Bank. Suppliers or importers, as a result, should inquire about purchasers' ability to acquire foreign exchange prior to shipping on open account or under cover of a sight draft.

Telecommunications Equipment Market

In Guatemala, as in the rest of Central America, the largest buyer of telecommunications equipment and systems is the national telephone and telex agency, known in Guatemala as GUATEL (Empresa Guatemalteca de Telecomunicaciones). GUATEL provides telephone services to 122,500 subscribers and telex services to 1,296 subscribers. Present plans call for these services to expand to 309,600 telephone subscribers and 875 more telex subscribers by 1987. A telephone expansion project for more than 100,000 lines, partially financed by the International Bank for Reconstruction and Development (IBRD), is scheduled to be let out for bids in late 1982 or early 1983.

There are 114 privately owned AM and FM radio broadcasting stations in the country of which 72 operate in Guatemala City. One government-owned TV station (Channel 5) and four privately-owned broadcast TV stations operate on the vhf band, usually from 11 in the morning until midnight. Permit requests have been filed to operate three private cable TV stations and one uhf subscriber station, but approval is still pending.

Approximately 75 to 80 percent of telecommunications equipment that is sold in the local market is imported. Small vhf and hf radio transceivers, TV sets, radio receivers, tape recorders, record players, and recording tapes are domestically assembled. Imports of telecommunications equipment and systems totaled $20.4 million in 1981 and are projected to top $31 million in 1987. Market segment details are shown in table 1.

Mobile radio.—According to information provided by importers and retailers, sales and installation of hf, vhf, and uhf equipment increased approximately 15 to 20 percent in 1982. Because of the prevailing security conditions within the private sector as well as in certain government

Table 1.—Guatemala: Imports of telecommunications equipment by country of origin, 1979-82 and projected 1987 (in thousands of U.S. dollars)

	1979	1980	1981	1982	Projected 1987
Transceivers, radio-telephones, TV cameras, CCTV transmitter, radio telegram equipment, TV sets					
United States	2,403	1,121	1,423	1,235	
Taiwan	721	582	289	183	
Japan	2,673	286	598	184	
Hong Kong	643	205	135	96	
Panama	—	90	45	45	
Singapore	456	29	16	12	
Brazil	25	13	—	9	
Korea	141	—	12	8	
Germany	—	152	—	3	
Costa Rica	1016	—	—	—	
Nicaragua	259	—	—	—	
Israel	—	117	—	—	
Others	—	175	108	22	
Total	8,337	2,770	2,626	1,797	2,800

Source: U.S. Department of Commerce, Foreign Commercial Service, American Embassy Guatemala City report, "Telecommunications Equipment and Systems—Guatemala," September 1982, and addendum, March 1983.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1=Q1.

Table 1.—Guatemala: Imports of telecommunications equipment by country of origin, 1979-82 and projected 1987 (in thousands of U.S. dollars)—Continued

	1979	1980	1981	1982	Projected 1987
Tubes transistors, resistors, parts					
United States	1,344	842	1,198	2,508	
Japan	1,407	2,083	2,361	1,294	
Taiwan	391	306	1,238	407	
Mexico	50	38	121	142	
Singapore	74	107	180	87	
United Kingdom	160	87	98	20	
Germany	79	17	31	10	
Hong Kong	912	619	460	8	
Malaysia	84	63	21	2	
Switzerland	388	—	19	—	
Brazil	287	—	—	—	
Others	187	76	23	79	
Total	5,363	4,238	5,750	4,557	5,900
Microphones, speakers, amplifiers					
United States	462	567	441	200	
Japan	747	827	1,093	464	
Taiwan	69	48	46	109	
Puerto Rico	56	45	33	33	
Hong Kong	95	44	72	22	
Singapore	—	50	33	19	
Italy	28	27	16	19	
Germany	10	9	7	12	
Korea	34	15	—	3	
Netherlands	32	10	2	—	
Others	113	73	66	73	
Total	1,646	1,715	1,809	954	2,000
Radars, navigation equipment and parts					
United States	1,432	842	1,386	1,951	
Japan	36	75	144	366	
Germany	169	453	37	44	
Sweden	—	—	503	—	
Italy	—	15	15	—	
Israel	98	22	7	—	
Others	95	42	55	40	
Total	1,830	1,449	2,147	2,401	3,000
Telegraph and telephone equipment and parts					
United States	6,478	3,308	2,439	1,996	
Brazil	—	—	—	3,455	
Germany	1,216	677	647	2,747	
Japan	283	677	319	630	
Sweden	134	585	1,170	308	
Denmark	—	118	45	244	
Italy	67	44	152	149	
Canada	31	200	57	91	
France	—	154	6	83	
Korea	63	43	—	44	
United Kingdom	12	—	577	36	
Czechoslovakia	70	41	23	29	
Switzerland	—	6	762	—	
Netherlands	351	27	3	—	
Others	109	79	163	651	
Total	8,814	5,959	6,363	10,463	13,000
Alarm systems and electric bells					
United States	41	97	264	54	
Costa Rica	—	27	40		
Italy	19	7	18	4	
Taiwan	10	2	19	3	
Germany	25	3	4	—	
Japan	22	3	—	—	
Others	16	8	6	—	
Total	133	147	351	65	460
Signaling systems					
United States	197	134	144	228	
Mexico	—	20	27	9	
Israel	—	—	—	7	
Germany	4	5	2	3	
Italy	8	1	—	1	
Japan	2	—	2	—	
Others	2	2	10	1	
Total	213	162	185	249	283
Test and measurement equipment					
United States		1,063	919	897	
Brazil		—	20	502	
Japan		144	120	114	
Taiwan		—	—	15	
Germany		29	77	14	
Italy		—	11	12	
Sweden		—	6	6	
Canada		7	21	4	
Spain		12	15	—	
United Kingdom		12	2	—	
Hungary		9	—	—	
Others		28	17	2	
Total		1,304	1,208	1,566	3,900

Source: U.S. Foreign Commerical Service Report, "Telecommunications Equipment and Systems—Guatemala," September 1982, and addendum, March 1983.

agencies, a good number of mobile units (vhf and uhf) have been installed in private and official vehicles. The same may be said for other security devices, such as warning lights, sensors, alarms, closed circuit TV, and related items. Approximately $800,000 worth of hf, vhf, and uhf communications equipment was sold in 1981 to the private communications sector alone and, according to importer/distributors, the sales of this equipment for 1982 may reach $1.2 million. If this trend continues, annual sales of equipment within this product category will go up to $2.4 million by 1987.

The only radio-telephone system in use was established in 1968 by a private coffee growers group, the Eastern Guatemala Growers Association, which installed a small General Electric system of 55 automatic mobile units to serve some of its members. The system was connected to GUATEL's central telephone network and had a total capacity of 240 users. The network operates through four channels and has around 100 subscribers.

The demand for radio-telephone was established by GUATEL after a study of the commercial-economic development and productivity of the various regions of the country. Based on this information, the priority of end-users for radio-telephone lines was determined.

The first stage, planned to be developed between 1980 and 1985, will cover the capital city, the south coast slope, and the southwest region. The distribution for the estimated demand is as follows:

Guatemala City	2000 units
Quezaltenango	162
Retalhuleu	105
Suchitepequez	78
Escuintla	80
Sacatepequez	91
Santa Rosa	46
Jutiapa	38
Total	2,600

The rest of Guatemala's larger towns will be covered with the second stage (1986-90) of the program, since the present demand in these areas is not very significant (about 14 lines per town). However, second priority will be given to the Departments of Alta Verapaz, Peten, Izabal, Zacapa, and Chiquimula.

The third stage (1991-95) will address the north and northwest regions of the country. The fourth stage (1996-2000) will complement the serviced regions listed in previous stages.

The new system will have the capacity of providing perfect link facilities with the central digital exchanges located in the capital city and the main cities within each covered region. Therefore digital equipment will be desired.

Base stations will cover an area with a minimum radius of 30 km. Transmitter power will be on the order of 25 W, and the mobile power transmitter units will be of 5 W. Frequencies to be utilized will be located between 400 and 500 MHz on the radio spectrum. The number of trunk channels will be calculated on the basis of 0.03 erlangs per subscriber.

Paging communications services have also increased for the past year—five private paging exchanges operate in Guatemala serving approximately 7,000 subscribers. Their equipment was supplied by NEC (Japan) and Motorola, Bell & Howell, KEL, Rich, General Electric, and Regency of the United States.

Telex equipment.—All telex operations are controlled by GUATEL. Telex equipment installed to GUATEL centrals should have the following protection: lightning arresters, interference suppression filters, and protection against electrical current overload.

Teleprinter operation mode should be 2-wire simple current (± 40 mA and telegraphic voltage of ± 60 volts) and 2 and 4 double-current wire (± 20 A and telegraphic voltage of ± 60 volts). Teleprinters should be automatic electronic including the keyboard, although the perforator and the ribbon reader may be manual.

Signaling requires an A or B type keyboard. Speed and teletype coding should conform to the CCITT codes No. 2 and 5, variable transmission between 50 and 300 bauds. Impulse stop duration should be programed at 1, 1.5, and 2 times the information pulse duration.

Interconnection between subscribers should be of duplex and semiduplex type. Synchronization distortion of transmitted signals on a simple current should not exceed 10 percent. Synchronization distortion of transmitted signals on a double current should not exceed 4 percent (Section 5.3 Volume VII CCITT Code). Electric current in Guatemala is 110/220 volts or 129/240 volts; 60 hertz, single or three phase.

Test and measurement equipment.—The market for test and measurement equipment used in telecommunications averaged $1.3 million a year from 1980 to 1982. Despite the present economic situation in the country, total imports of this equipment increased from $1.2 million in 1981 to $1.5 million in 1982. Sales are expected to reach $3.9 million a year by 1986-87.

Imports from the United States amounted to approximately 71 percent of the total during 1980-82, although there was a marked decline between 1980 and 1982 when problems in obtaining foreign exchange were encountered. Nevertheless, importers believe that demand for testing apparatus will recover during 1983 or 1984.

Traditional competitors to U.S. suppliers include manufacturers from Japan, Germany, Taiwan, and lately from Brazil. Exporters in some of these countries enjoy their Governments' support in securing credit when they ship to countries where the acquisition of foreign exchange is difficult. No Guatemalan firms manufacture or assemble testing and measuring equipment for telecommunications applications.

Competitive Assessment

U.S. suppliers.—Over the past 3 years, the U.S. share of the telecommunications equipment import market has declined from a high of 50 percent in 1979 to 38 percent in 1981. Six-month statistics in 1982 indicate that telecommunications imports will total $22 million in the year, of which U.S. firms will supply 41 percent ($9.1 million). Importers have stated that their preference for U.S. equipment is due to good, fast service and the availability and quality of products previously ordered. Another factor which favors purchasing decisions for U.S. equipment is the proximity of the United States, which translates into faster and cheaper delivery. However, some importers and distributors complained that credit facilities from U.S. suppliers have been reduced from levels enjoyed in the past. Because of payment problems resulting from Guatemala's lack of foreign exchange, the usual terms now are payment against shipping documents or letter of credit. The increase of market share by competitors has been heavily influenced by their continuation of relatively liberal credit terms, backed by their Governments' guarantees. U.S. suppliers are at a decided disadvantage in this respect.

Third-country suppliers.—The strongest competitors of U.S. suppliers of telecommunications equipment and systems have been the Japanese, followed by suppliers from Taiwan, Germany, Sweden, and Hong Kong (see Leading Supplier list). The following are some items imported by third-country competitors into Guatemala. From Japan: Oki telexes; NEC multiplexers, telephone sets and exchanges, TV sets, and radio receivers; Yaesu transceivers; and Sony CCTV's. From Germany: Siemens telephone exchanges, PBX systems, and telephone sets; radio equipment made by Blaupunkt; and Telefunken telephone sets. From Sweden: Ericsson telephone sets, plants, PBX's, and exchanges. From the Netherlands: Philips PBX systems, telephone sets, intercommunicators, and telephone answering systems.

Domestic suppliers.—The local telecommunications equipment and systems industry is limited to the assembling of TV sets, radio receivers (AM-FM), record players, tape recorders, speakers, recording tapes, and medium-sized vhf and uhf radio transceivers (see table 2). GUATEL assembled several thousand dial telephone handsets in 1979 that it sells on a voluntary basis to new subscribers. Local manufacturers enjoy the benefits of the Fiscal Incentive Law which allows them

Table 2.—Guatemala: Local production of telecommunications equipment, 1979-1981, and estimated 1982 and 1987
(values shown in millions of U.S. dollars)

	1979		1980		1981		1982		1987	
	Units	Value	Units	Value	Units	Value	Units	Value	Units	Value
TV sets	14,730	3.0	10,180	2.1	12,000	2.6	13,500	2.9	15,500	4.2
Radios	95,139	1.8	75,260	1.4	91,400	2.0	95,200	2.4	110,000	3.5
Record players	21,756	4.0	17,350	3.2	19,000	3.6	21,100	3.9	23,100	4.4
Tape recorders	6,289	.7	5,200	.6	6,500	.8	6,900	1.0	9,500	1.7
Speakers	6	.04	400	.02	700	.04	900	.05	2,400	.09
Recording tapes	692,010	.7	400,125	.4	600,250	.7	600,600	.7	925,000	1.1
Total		10.2		7.9		9.7		10.9		14.9

Source: U.S. Department of State, American Embassy Guatemala City, "Telecommunications Equipment and Systems—Guatemala," September 1982.

to import electronic components, parts, and materials for their assembling operations duty-free.

End-User Profiles

GUATEL.—GUATEL, the government-owned autonomous telecommunications monopoly, was formed in 1971 by the merger of two former telecommunications entities. GUATEL is responsible for all international and domestic telecommunications services except domestic telegraph service, which is provided by the Direccion General de Correos y Telecomunicaciones - DGCT (General Directorate of Posts and Telecommunications). GUATEL represents Guatemala on the Central American Regional Technical Commission on Telecommunications (COMTELCA), the coordinating body for telecommunications of the five Central American republics, and owns and operates the Guatemalan portion of the Central American regional microwave network that was completed in November 1971. The overall policy of the telecommunications sector is the responsibility of the Ministry of Communications and Public Works. Coordination of sector investments is under the National Economic Planning Council (CONAPLAN).

GUATEL has 53 automatic exchanges with a present capacity of 100,000 subscribers in Guatemala City and 22,500 in the rest of the country. Present plans call for GUATEL to invite bids in late 1982 or early 1983 for a $208 million project for 79,000 additional lines in Guatemala City and for 24,800 additional lines outside Guatemala City. Telephone services are heavily concentrated in the Guatemala City metropolitan area, which is both the governmental and economic center of the country. The long distance network consists mainly of carrier equipment over open wire lines, uhf/vhf radio systems, and some cable lines. The total number of circuit kilometers is about 25,000. A subscribers trunk dialing (STD) system connects Guatemala City and 140 other cities within the country. There are 468 public pay stations in rural areas.

Subscribers are free to purchase their own equipment to connect to the system, although GUATEL offers handsets for sale at low cost to new subscribers as well as a maintenance and repair shop. Equipment connected to the system must, however, meet GUATEL standards. Domestic microwave links are now being used between Guatemala City and 18 towns (20 by the end of 1982) inside the country. GUATEL plans to install two frontier microwave stations of four channels each by 1986, one at the Mexican and the other at the Salvadorean border.

International telephone services are provided by some 195 circuits through the COMTELCA microwave network and automatic international exchange. GUATEL has a satellite earth station, supplied in 1981 by the Harris Corporation, with 960 channels. However, only 360 are currently in operation. Telex services, mainly international, are provided by an exchange (Astrodata) with 1,156-line capacity in Guatemala City and 140 in the rest of the country; the total number of subscribers is 955. Telex machines must be purchased and installed by subscribers. Installed teleprinters include Siemens T1000's, ASR-32's, and ITT devices. In addition, machines have been approved for connection to the system from Extel (United States), Sagem (France), Olivetti (Italy), Ericsson (Sweden), and Wandel & Golterman (Germany).

International facilities improved greatly with the introduction of the Central American network

Table 3.—Guatemala: Projected telephone and telex line demand, 1985-2000

	Number of Lines			
	1985	1990	1995	2000
Telephone and telex lines	344,186	480,118	595,950	671,656
Coin-operated telephones	6,825	9,512	11,787	12,192
Mobile telephone units	2,600			
Rural telephones	3,660			
Telex lines	2,333	3,600	5,781	9,063

Source: U.S. Foreign Commercial Service report "Telecommunications Equipment and Systems—Guatemala."

(COMTELCA). Traffic has notably increased—from 10 million communications/minutes in 1972 to 20.1 million communications/minutes in 1981—since the installation of the fully automatic international telephone exchange that allows the subscriber to dial directly to most of the world. International telegraph and telex services are of satisfactory quality. Utilization is projected to increase nearly 25 percent per year through 1987 (see table 3).

Within GUATEL's telephone network, because of previous contract awards, different brands of equipment and equipment technologies, such as Siemens, Ericcson, ITT, NEC, and others, have been installed in the system, and the incompatibility of much of this equipment has caused interlink and operational problems to GUATEL technicians, as well as to the subscribers. Therefore, future development plans call for the complete standardization of all telephone and telex networks.

In 1980, GUATEL decided to make the telephone transmission and exchange systems compatible with digital technology. This decision was based on cost of the equipment, better central remote controls, and smaller equipment size. The central links will be a pulse-code modulation (PCM) system that will result in significant savings in cable. Finally, digital systems are preferred by GUATEL because the rest of the world is presently adopting this technology and, therefore, communication facilities over the international telephone network will be greatly improved.

GUATEL has adopted for its future subscriber installations the latest technology in telephone handsets, which will have transmission reference equivalent, including its cable, of 6 dB for up to 1000 ohms of line resistance and a reception reference equivalent, including its cable, of -2 dB for up to 1000 ohms of line resistance. Without including the cable and considering a line with 1000 ohms of resistance, the transmitting reference equivalents of transmission and reception would be of 1 dB and -8 dB, respectively. The telephone having these specifications has been named by GUATEL the "TM Telephone" (Telefono Moderno).

Several major projects are scheduled for development within the next 18 months (see tables 4 and 5). Invitations for prequalification and bidding on these projects were to be published in the local media around the end of November 1982. The projects are expected to be financed by GUATEL, the suppliers, and IBRD. IBRD is considering but has not yet approved a loan for $30 million of the total $237 million project.

Table 4.—Guatemala: GUATEL major projects, 1982-83

1. Design, construction, and distribution of 79,000 additional telephone lines to be serviced in the four capital city exchanges as follows:

TIVOLI III	29,000 lines
MONTE VERDE III	20,000 lines
EL CARMEN II	18,000 lines
GUARDA VIEJO III	12,000 lines
	79,000 lines

- Remote Units (Concentrators):

TIVOLI III	14 units
MONTE VERDE III	7 units
EL CARMEN II	14 units
GUARDA VIEJO III	15 units
	50 units

With the following additional equipment:
- PCM links of 30 + 2 equipped channels
- 8 Mbps links or optical fiber
- Connection of the new network to the existing one

2. Guatemala City Central Interurban Exchange; Digital Exchange consisting of 918 incoming circuits and 786 outgoing circuits.
3. Quezaltenango City Central Interurban Exchange; Digital Exchange consisting of 111 incoming circuits and 99 outgoing circuits.
4. Digital Central Exchange: With a capacity of 24,800 lines to interconnect 23 towns outside of the capital city with the Interurban Central Exchanges described in 2 and 3.
5. 3,500 coin-operated public telephones to be interconnected with the Interurban Central Exchange.

Source: U.S. Foreign Commercial Service report "Telecommunications Equipment and Systems—Guatemala."

The following persons are the key contacts at GUATEL:

Coronel Carlos A. Mendez C., Manager
Telephone: 84777

Ing. Roberto Goyzueta, Assistant Manager
Telephone: 85898

National Police.—The National Police have budgeted close to $250,000 for telecommunications equipment between 1983 and 1985. The equipment will consist of vhf and uhf transceivers, repeaters, CCTV's, alarm and detection devices, public address systems, amplifiers, and radar speed-control systems and antennas. However, since the budget was frozen for the latter part of 1982, acquisition of the equipment will not start until early 1983. Interested exporters should contact:

Col. Hernando Ponce N., Director
Direccion General de la
Policia Nacional
6a. Avenida 13-71
Zona 1
Guatemala City, Guatemala
Telephone: 515158, 515177

Table 5.—Guatemala: Long-range telecommunications projects

Projects to be developed in 1983 and financed by the Central American Bank for Economic Integration (CABEI)

1. PCM links to interconnect approximately 10,000 channels of different capacity to the suburban concentrators (commutators).
2. 1 telex central exchange with 1,024 terminals.
3. 7 time-division multiplex systems for the metropolitan area.
4. 200 teleprinters.
5. Facsimile terminal equipment to be installed in public telephones.

Projects to be developed in 1985 - first stage

1. Improvement of the main trunk telephone channels to the existing central exchange in 21 towns.
2. Acquisition of 300 multiplex channels to be added to the existing Guatemala-Puerto Barrios system.
3. Improvement of the microwave transmission system existing between the city of Puerto Barrios and the town of Santa Elena, Peten, which now has 300 multiplex channels.
4. Rural Area Telephone System: Acquisition of equipment to develop the third stage of this project. This equipment will consist of PCM systems, vhf and uhf radio systems, and frequency monitoring equipment to interlink 150 towns.
5. Communications by submarine cable which will connect Central America and the State of Florida in the United States with an approximate capacity of 3,000 TP channels.
6. Interconnection in the capital city between the satellite earth station recently installed on the city's outskirts and the GUATEL communications tower located in the city's zone 9. This link is to be provided with alternate security multichannel system with capacity for 960 channels.

Projects planned for 1987

Telephone system	– Installation of approximately 67,960 additional lines, plus 5,375 coin-operated public telephones
Telex system	– Installation of approximately 635 additional lines.
Submarine cable	– Installation of terminals and subterminals if the physical works of the laid cable are completed by then.

Source: U.S. Foreign Commercial Service report. "Telecommunications Equipment and Systems—Guatemala."

National Electrification Institute (INDE).—According to the planning department of INDE, an invitation to bid was to be published in the local media in November 1982 for the acquisition of vhf and uhf communications equipment, including base stations, mobile units, repeaters, and antennas. Projected investment will be around $55,000. Bidding for this equipment will be under the terms of the procurement and bidding law. Interested exporters should contact:

Ing. Edwing Rivera, Chief
Departamento de Comunicaciones
INDE -Guatemala Sur
San Jose Villa Nueva, Guatemala
Telephone: 460212

Ministry of Defense.—The Guatemalan army has a large amount of radio communications equipment, including hf, vhf, and uhf receivers and transmitters with the following trademarks: Hallicrafters, ICOM, RCA, Midland, and Atlas (United Kingdom). These units are either old or in poor operating condition. According to the procurement office of the army, more than 50 percent of the existing telecommunications equipment will be replaced. New equipment to be ordered will include a command communications system. The date for the acquisition of this equipment is at present unknown. The key contact at the Guatemalan army is:

Col. Jorge M. Estrada, Chief
Ministerio de la Defensa Nacional
Estado Mayor del Ejercito
Seccion de Logistica
Palacio Nacional
Zona 1
Guatemala City, Guatemala
Telephone: 21212, Ext. 748

Marketing Practices

Channels of distribution.—Approximately 80 percent of imported telecommunications equipment and related items are handled through local representatives/distributors, who in turn sell to retailers or end-users. The remainder is purchased directly by end-users in the product's country of origin. Nearly 90 percent of testing and measuring equipment is sold from catalogs.

Distributors or indent agents very seldom keep large merchandise inventories, unless the product has a high local turnover. Some importers of test and measurement equipment keep relatively small stocks of low-value equipment. Sometimes, when a particular spare part is not found locally, the equipment owner places his order directly with the manufacturer or foreign supplier. Exporters may wish to use the services of a bonded warehouse in Guatemala.

It is suggested that U.S. exporters of telecommunications equipment and systems who are not locally represented appoint a reliable agent/distributor to market their products in Guatemala. However, vendors should be aware of Congressional Decree No. 78 of September 29, 1971, which sets forth the legal standards regulating agency, distribution, or representation contracts entered into with national or foreign firms.

Government purchases.—The government procurement law (Decree 35-80) stipulates that purchases exceeding $12,000 by any government agency must be made through public bidding and no fewer than five bidders must participate. Government purchases are generally exempted from import duties. Unless otherwise specified, all government public bidding requires that foreign suppliers meet prequalification requirements. Foreign bidders must also have a locally registered, duly legalized representative. For further information on prequalification procedures, contact:

Lic. Gustavo A. Samayoa R., Jefe Dept.
Departmento de Bienes del
Estado y Licitaciones
Edificio de Finanzas - Nivel 13
8a. Avenida y 21 Calle
Zona 1
Guatemala City, Guatemala
Telephone: 21740

Trade Restrictions

Tariffs.—Imports into Guatemala are governed by the Central Treaty for Central American Economic Integration and the Central American Countries convention on the Equalization of Import Duties and Charges subscribed to by the members of the Central American Common Market (CACM). Import duties under the Central American Uniform Tariff Nomenclature (NAUCA) are compound, since most of the items are subject to both a specific duty based on weight or volume and an ad valorem duty based on c.i.f. value at port of entry. Duties on capital goods or agricultural equipment are relatively low, ranging from 5 to 15 percent. Consumer goods not produced locally are assessed at from 25 to 50 percent. The applicable duty rates in Guatemala for the importation of telecommunications equipment are shown in table 6.

An internal fiscal tax of 3 percent must be added to the import duties. In addition, the San Jose Protocol has as its basic effect the application of a 30-percent surcharge on the duties applicable at the time of importation on most items not produced within CACM.

Table 6.—Guatemala: Duty rates on imported telecommunications equipment by product classification

NAUCA code and description	Specific (Quetzales per kilogram)	Ad valorem percent c.i.f.
721-04-01-00 Radio transmitters and transceivers, with or without cabinet	Free	10
721-04-01-01 Radio-telephone equipment	Free	10
721-04-01-02 Radio receivers combined with phonographs or recorders or not, with or without cabinet	1.00	25
721-04-01-03 Television transmitters	Free	10
721-04-01-04 TV sets under 21 inches screen	1.00	25
721-04-01-05 TV sets over 21 inches screen	1.50	50
721-04-02 Tubes and valves for the above mentioned category (721-04-01)	1.00	20
721-04-03 Microphones, loudspeakers, and amplifiers (except amplifiers for telephones and movie projectors)	.50	20
721-04-04 Condensers, filters, and other accessories and parts N.E.C. for apparatus in 721-04-01 (except cabinets which are classified by material)	Free	25
721-04-05 Electronic apparatus, accessories and parts N.E.C.	Free	25

Table 6.—Guatemala: Duty rates on imported telecommunications equipment by product classification—Continued

NAUCA code and description	Specific (Quetzales per kilogram)	Ad valorem percent c.i.f.
721-05-00 Telephone sets, telegraph keys, earphones, PBX's, exchanges, telexes, teletypes	.15	20
721-08-01 Test and measurement equipment (electrical power)	.05	10
721-08-02 Test and measurement equipment (electronics)	.10	10
721-08-03 Electric bells all types (alarm systems)	.15	30
721-08-04 Signaling systems	Free	15

Source: U.S. Foreign Commercial Service report, "Telecommunications Equipment and Systems—Guatemala."

Foreign currency exchange control.—Exchange controls are provided for in the Emergency section of the Monetary Law (Decree 203) published on December 17, 1945, and were in effect for the first time from October 13, 1962, to January 15, 1973. A number of domestic and international economic and political factors caused Guatemala to suffer a considerable decline in foreign exchange reserves late in 1979, which accelerated in early 1980. For this reason, the Central Bank (Banco de Guatemala) authorities on April 23, 1980, announced the full control of foreign exchange transactions to halt the leakage of funds from Guatemala to other countries. The existing exchange control permits full repatriation of earnings and payment for all imports without exception. A remittance tax of 11 percent is, however, applied to profits remitted by foreign-owned firms. Importers have been experiencing delays of varying lengths, but averaging about 90 days, in receiving foreign exchange. As currently managed, effectively no foreign exchange is available from the Bank of Guatemala for a broad range of consumer imports, although exchange purchased in the black market is often used for this purpose. This should be taken into account by U.S. suppliers/exporters contemplating export transactions with Guatemalan customers.

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Telephone and telex equipment		
Compania Comercial Philips	Guatemala	Telephone sets
American Telecom Inc.	United States	Telephone sets, intercom systems
Communitron	United States	Intercom and telephone
Concept-10	United States	Telephone answering plants
Cook Electric	United States	Switchboards, PBX's
Executone	United States	Switchboards
Extel Corp.	United States	Telephone communication systems
Fischer Berkley Corp.	United States	PBX's
GTE Sylvania	United States	Switchboards, PBX's, telephone sets, intercom systems
General Electric	United States	Intercom systems
ITT	United States	Telephone exchanges, switchboards, handsets
Mitel	United States	Switchboards, PBX's
North Supply Company	United States	Switchboards, PBX's
Phone Tele-Sec	United States	Telephone answering systems
Security Industries	United States	Alarm systems
Teletype Corp.	United States	Teleprinters
Ustrom	United States	Telephone sets
Wescom	United States	Telephone carriers
Western Electric	United States	Teletypes, switchboards
Aiphone Equipment	United Kingdom	Telephone Switchboards, telephone sets
Bandar	Germany	Teleprinters
Civic	Japan	Digital telephone sets
Cobra	Japan	Intercom systems
Eagle	Hong Kong	Wireless telephones
Ericsson	Sweden	Telephone exchanges, switchboards, PBX's, telephone sets, telexes, intercoms
Lake	Hong Kong	Wireless telephones
Lion	Japan	Intercom systems
Marconi	Canada	Switchboard plants, telephone sets
Mitsui Ltda.	Japan	Telephone switchboards, telephone handsets
NEC Equipment	Japan	Switchboards, PBX's
Nitsuko	Japan	Telephone handsets
Olivetti	Italy	Telex systems
Sagem	France	Telex systems
Siemens	Germany	Telephone exchanges, PBX's, telephone sets, switchboards, handsets
Superior	Hong Kong	Telephone amplifiers
Telephon Braun	Germany	Telephone central office equipment, telephone sets
Ticino	Italy	Office plants, handsets, intercom systems

Leading Suppliers—Continued

Name	Country(ies) of Manufacture	Type of Equipment
Wandel & Golterman	Germany	Telex, teleprinters
Sitom	Taiwan	Telephone sets
Transmission equipment		
Amphenol	United States	Wire terminals
Milwaukee Resistor Corp.	United States	Electronic components
R-TEC	United States	Telephone carrier systems
The Cooper Group	United States	Communications cable
Triplett	United States	Electronic components
Western Electric	United States	Multiplexers, carriers
Mobile radio		
Fischer Berkley Corp.	United States	Paging systems
GTE Sylvania	United States	Radio telephones
Incom	United States	Hf transceivers
Johnson	United States	Mobile transceivers
Motorola	United States	Paging systems
Simpson	United States	Uhf, vhf radios
Standard	United States	Vhf and uhf radio communication systems
Swan Communications	United States	Hf, vhf, uhf radio communication systems
Ericsson	Sweden	Paging systems
Unitel (Motorola)	Brazil	Radio transceivers
Yaesu	Japan	Hf, vhf, uhf radio communication systems
Video and audio broadcasting		
Cia. Curacao de Guatemala, S.A.	Guatemala	Radio receivers
Compania Comercial Philips	Guatemala	Radio receivers
Fabricas Electronicas Unidas	Guatemala	Radio receivers
Industria Electronica LARCO	Guatemala	Radio transceivers, speakers, amplifiers
Telemundo, S.A.	Guatemala	Radio receivers, tape recording decks, sound equipment, amplifiers, speakers
Collins Radio	United States	Radio communication systems
Force	United States	Radio communication systems
Javelin Electronics	United States	CCTV equipment
Johnson	United States	Radio communication systems
Motorola	United States	Radio communication systems, radio-telephone equipment
Repco	United States	Radio transceivers
Stoner Electronics	United States	Radio communication systems
Wilson	United States	Radio communication systems
Data communications equipment		
Teletype Corp.	United States	Modems
Communications test and measurement equipment		
Elcom	United States	Test instruments
Northern Telecom	Canada	Telephone testing equipment

Most Salable Products

- Telephone exchanges
- Telephone sets
- Telephone switchboards
- Carriers for telephone systems
- Telexes and teleprinters
- Paging systems
- Telephone multipair cable
- Private radio communications systems, hf, vhf, and uhf
- Video tape recorders and cameras
- Magnetic tape for video recording
- Closed circuit TV systems
- Electric alarm and security equipment
- Antennas
- Electronic components for assembling purposes
- Telephone, radio communications, and TV spare parts
- Telephone lines testing equipment
- Telephone lines signal generators
- Frequency meters
- Low-voltage sensitive meters
- Decibel meters
- Antenna tuners
- Microwave testers
- FM monitors
- FM deviation meters
- Voltage/ampere meters
- Oscilloscopes
- Color TV bar generators
- VTVM's
- Multimeters

Guatemala: Basic Economic Indicators

Population:	7.54 million (1982)	Major trading partners:	United States, CACM, West Germany, Japan, Venezuela
Area:	108,880 sq. km.		
Administrative units:	22 departments	Exchange rate:	Quetzal 1=US$1 (1982)
GDP:	$7,853 million (1981)	Fiscal year:	Calendar year
Per capita income:	$1,158 (1981)	Current account balance:	-$163 million (1980)
Inflation rate:	10.4% (1980)	International reserves:	$25.4 million (1981)
Exports f.o.b.:	$1,226 million (1981)	Federal budget	
U.S. share	$308 million (1981)	revenues:	$815 million (1981)
Imports c.i.f.:	$1,673 million (1981)	expenditures:	$1,280 million (1981)
U.S. share	$561 million (1981)	Labor force:	757,000 (1980)

Additional Information

For additional information, please contact the project officer responsible for Country Market Surveys on telecommunications equipment:

Hayden M. Wetzel
Market Research Division Rm. 2012
International Trade Administration
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-4493

For additional copies of this report or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-2988

Useful Addresses

Embassies:

American Embassy
Commercial Section
7-01 Avenida de la Reforma
Zone 10
Guatemala
tf: 31 15 41

Embassy of Guatemala
2220 R Street, N.W.
Washington, DC 20008
tf: 745-4952

Telecommunications administration:

Ministerio de Comunicaciones y Obras Publicas
6 Calle, 6y 7 Av.
Zona 1
Guatemala City
Attn: Ministro de Communicaciones y Obras Publicas
tf: 2 12 12
tg: miniscop guatemala

PTT:

Empresa Guatemalteca de Telecomunicaciones (GUATEL)
7a Avda. 12 - 39
Apartado Postal 811
Zona 1
Guatemala City
Attn: Gerente de la GUATEL
tf: 8 05 98
tx: 5333 geguat gu

Leased lines and data communications:

Empresa Guatemalteca de Telecomunicaciones (GUATEL)
7 Avda. 12-39
Apartado Postal 811
Zona 1
Guatemala City
tf: 8 05 98
tx: 5333 geguat gu

Radio broadcasting:

Ministero de Comunicaciones y Obras Publicas
Direccion General de Radiodifusion y Television Nacional
6 Calle, 6y 7 Av.
Zona 1
Guatemala City
Attn: Director General
tf: 2 50 45

Television broadcasting:

Canal 5 Television Cultural y Educativa
4 Calle 18-38
Zona 1
Guatemala City
tf: 53 21 03

Technical standards:

Comision Guatemalteca de Normas
Departmento Industrial
Ministerio de Economia
12 Calle 1-36
Zona 5
Guatemala
tf: 8 50 59

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Colombia

CMS/TCE/301/83, April 1983

CMS

Country Market Survey

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JUN 9 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Telecommunications Equipment

Colombia

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The market for telecommunications equipment in Colombia is expected to grow substantially through 1986 as efforts are made to overcome the country's communications problems stemming from the three high mountain ranges that divide the country and the wide dispersion of the population. In telephony, the major emphasis is on conversion from electromechanical to digital switching equipment. This shift is expected to generate interest in fiber optics applications in cable television and data transmission systems. Increased demand is anticipated for microwave equipment, including associated multiplex equipment, given the economic advantage of this type of transmission. Requirements for mobile radio services for aviation, marine, public safety, and industrial users are also growing. The introduction of the NTSC color television broadcasting system in Colombia in 1979 has created a continuing demand for broadcasting equipment, receivers, and video cameras from INRAVISION, the national television network, and from independent television production companies, which need transmission and studio equipment.

Imports, which constitute a major part of the telecommunications equipment market, are projected to rise from $106 million[1] in 1981 (see table 1) to $130 million in 1984. Imports declined

Table 1.—Colombia: Imports of selected telecommunications equipment, 1977–81

(in millions of U.S. dollars)

	1977	1978	1979	1980	1981
Telephone sets	2.78	5.95	3.12	7.44	8.34
Nonautomatic switchboards and exchanges	.88	1.34	1.71	1.10	1.27
Automatic switchboards and exchanges	27.15	32.03	104.67	55.60	58.10
Other electrical line telephonic equipment	6.15	1.13	1.69	3.80	7.29
Telegraph apparatus, including teleprinters	3.38	2.10	4.23	1.55	2.10
Special apparatus for carrier-current line system	2.89	.65	2.27	7.30	3.82
Parts for electrical line telephonic	1.92	2.04	1.75	3.70	3.25
Radiotelegraphic and radiotelephonic fixed or mobile apparatus	1.30	1.99	1.14	1.78	2.86
Other radiotelegraphic and radiotelephonic equipment	2.69	4.37	2.76	9.77	3.57
Radio-broadcasting transmission apparatus	.15	.22	.31	2.33	2.45
Other radio-broadcasting transmission equipment	.98	.94	1.10	—	—
Combined radio-broadcasting, reception for vehicles	1.67	1.96	3.15	1.82	.75
Other radio-broadcasting, reception apparatus	1.09	1.02	.72	1.71	1.47
Black and white television reception apparatus	.05	.15	.04	2.22	.88
Color and other television reception apparatus	2.04	2.00	2.89	—	—
Ferrite aerials for transmission reception apparatus	.01	.07	.03	1.10	1.23
Channel selectors for transmission reception apparatus	.64	.87	.28	—	—
Other parts for transmission reception apparatus	.14	.40	1.00	—	—
Parts and accessories for transmission reception	1.50	3.49	2.22	—	3.24
Coaxial cables	.14	.38	.27	.48	.55
Insulated electric wire-cable and telephone cables	.35	.08	.12	.13	1.90
Sound recorders	.13	.07	.14	—	—
Record players and tape decks	.06	.07	.09	.17	.09
Other combined sound recorders and reproducers	.71	.75	2.10	1.30	1.17
Television image and sound recorders and reproducers	.22	1.17	3.65	1.84	1.44
Videotapes	.07	.20	.35	.25	.28
Other videotapes and recorder tapes	.01	.03	.06	—	—
Total	59.10	65.47	141.86	105.39	106.05

Source: Colombian Foreign Trade Institute (INCOMEX) Imports Listing #7, January 1977 through December 1981.

Source: "Market Survey—Communications in Colombia," prepared by the U.S. Department of State (American Embassy Bogota airgram A-52, November 17, 1981; see Additional Information box), and further information from the Embassy supplied in February 1983.

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[1] All values are given in U.S. dollars. Local currency is converted at the following average exchange rates: US$1=36.77 pesos (1977), 39.10 pesos (1978), 42.55 pesos (1979), 47.28 pesos (1980), and 54.49 pesos (1981 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

about 4 percent in 1982 when most sectors of the economy experienced serious problems and Colombia registered an unprecedented low in real growth rate of only 1.3–1.5 percent. With the traditional slowdown in economic activity during presidential election years (the new administration was inaugurated in August 1982) and the consequent delays in project implementation due to changes in staff, a 2-year shift in major project scheduling is expected for the TELECOM Development Program, previously slated for the period 1981–87.

The share of imported equipment supplied by U.S. companies has been generally increasing since 1977, and during 1981 it reached 14 percent (see table 2). Users respect U.S. products for their good design and advanced technology, and equipment is generally considered price competitive with that offered by third-country sources.

Table 2.—Colombia: Imports of telecommunications equipment by country of origin, 1977–1981

(in millions of U.S. dollars)

	1977	1978	1979	1980	1981
United States......	3.68	8.81	14.57	13.45	13.40
Sweden	19.81	19.97	56.85	2.91	25.83
Japan	12.47	7.33	8.81	21.65	17.58
Germany	8.39	4.85	6.21	9.53	11.64
France	2.00	6.23	29.75	9.85	11.15
Belgium..........	2.18	1.99	.64	3.04	7.09
Panama	3.60	4.64	8.94	3.29	3.30
Italy	.70	1.11	4.20	3.24	2.47
United Kingdom ...	2.02	.22	2.98	21.30	2.16
Spain	.54	4.05	1.00	6.46	1.95
Other	3.70	6.30	7.90	10.95	9.36
Total	59.09	65.50	141.85	105.67	105.93

Source: Colombian Foreign Trade Institute (INCOMEX) Imports Listing #7 January 1977 through December 1981.

According to major end-users and trade sources, one reason for the failure of U.S. firms to secure a larger proportion of the import market may be their apparent inability to compete with third-country suppliers in financing and credit terms, a major consideration for the purchaser. Nonetheless, many U.S. companies are active in the market (see Leading Suppliers list), and certain market segments are dominated by U.S. sup-

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Candle Electronica de Colombia	Colombia	Color and black and white TV sets and parts
Carvajal S.A.	Colombia	Intercommunication systems
CEAT General	Colombia	Switching equipment, telephone cables
Colombiana de Comunicaciones CILCOM	Colombia	Telephone parts.
Colombiana de Telefonos	Colombia	Telephone parts
Comercial de Telefonia	Colombia	Telephone parts
Compania Electronica Colombiana	Colombia	Color and black and white TV sets; stereo equipment
Electronica Comunicaciones Ltda.	Colombia	Radio communications equipment
Fabrica de Radios McSilver	Colombia	National Panasonic color and black and white TV sets, stereo equipment
FACOMEC	Colombia	Switching equipment, telephone cables
Fase Ltda.	Colombia	Private radio communications equipment
GTE de Colombia	Colombia	Switching equipment, telephone cables
Hitachi Ltda	Colombia	Power plants for communications equipment
Industrias Colombo Britanicas Ltda.	Colombia	Radio communications equipment
Industria Phillips de Colombia	Colombia	Color and black and white TV sets and parts; radio communications equipment
Ingenieria Electronica Aplicada	Colombia	VHF radio equipment; mobile and portable telephones; modulation monitors
Jobi Ltda	Colombia	Color and black and white TV sets; stereo equipment
L.M. Ericsson	Sweden	Telephone sets, automatic switchboards
Sociedad Electronica y Comunicaciones	Colombia	Radio communications equipment
Telecenter Colombiana Ltda.	Colombia	Zenith color and black and white TV sets; parts and accessories for stereo equipment
Siemens	Germany	Telephone sets

pliers. During the period 1977 through June 1980, U.S. exporters accounted for 83 percent of all Colombian purchases of radiotelegraphic and radiotelephone transmission and reception apparatus and 30 percent of accessories in this category, representing total sales of $20 million; and 97 percent of radio broadcasting transmission and receiving equipment and 30 percent of accessories, with total sales of $8 million.

ITT has already enjoyed some success with the sale of semi-electronic switching gear for 60,000 telephone lines planned for installation in Bogota. Hughes Aircraft, RCA, and Ford Aerospace were included among the firms prequalified for participation in the SATCOL project, a plan to launch two satellites in 1985 to provide domestic services in telephony, television, telex, telegraph, radio program distribution, and data transmission services, each spacecraft having 25 transponders. This project is under complete review and could be postponed for a minimum of 2 years. The three major components of the project will be the space craft, earth stations, and a satellite control network.

Swedish and Japanese firms were the leading third-country suppliers in 1981, with French, German, and Belgian interests also well represented. In April 1981 Ericsson (Sweden) was awarded a contract to install 3,000 new telephone lines for the Ibague ARF telephone exchange, and Siemens of Germany was among the major suppliers of telephone equipment. However, competition from the Japanese firms NEC and Fujitsu, which are making inroads in the field of advanced telephone equipment, is increasing. French companies such as Compagnie Generale de Telegraphie Sans Fils BP and Thomson CSF have been making aggressive attempts to penetrate the Colombian market. Thomson was awarded the contract to build the second earth station at Choconta and the 400 channels for the international dialing exchange recently inaugurated in Bogota.

Local production of telecommunications equipment in Colombia remains at a low level and is limited mainly to cable products, some color and black-and-white television receivers, radio communications equipment, and telephone parts (see table 3). However, most Colombian manufacturers produce telecommunications equipment only as a sideline. A small PTT shop maintains and repairs existing equipment.

Although earlier attempts to attract foreign investment for local manufacturing largely failed, developments within the framework of the Andean Common Market have stimulated local production projects. Multinational manufacturers have started local assembly of color television sets, and new firms are now producing electronic components, parts, and accessories. Subsidiaries of Ericsson (FACOMEC), CEAT of Italy (CEAT General), GTE (GTE de Colombia), ITT, and Siemens are involved in the wiring of imported switching equipment, frames, and relays. They also produce telephone cables.

Table 3.—Colombia: Local production of selected telecommunications equipment, 1976–80

(in U.S. dollars)

	1976	1977	1978	1979	1980
Radio telephonic equipment	5,036	9,518	14,357	66,306	78,087
Radio antennas ..	533	1,076	5,569	13,352	5,506
Television antennas	8,859	14,449	19,881	7,043	22,077
Amplifiers	20,455	1,839	65,801	6,890	7,432
Radio and TV condensers and transformers ...	43,625	44,030	49,722	309,347	57,074
Parts and accessories for telephone and telegraph	204,795	269,960	79,510	88,204	740,062
Total	283,303	340,872	234,840	491,142	910,238

Source: National Administrative Department (DANE).

Colombian manufacturers export some of their output, mainly to Latin American countries, with the bulk going to Ecuador and Venezuela (see table 4). Insulated electric wire cable and telephone cables comprise more than 90 percent of all exports.

End-User Profiles

Government sector purchases account for more than 65 percent of the total telecommunications equipment market in Colombia, with imports making up the bulk. Large sums have been earmarked by the Empresa Nacional de Telecomunicaciones (TELECOM), the PTT authority, to further develop the country's telecommunications network (see table 5), with funding from the World Bank, the Inter-American Development Bank, and other foreign commercial sources. Other major end-users in both the public and private sectors, including radio and television broadcasting, are also embarking on ambitious development programs.

Table 4.—Colombia: Exports of selected telecommunications equipment, 1977–1981

(in U.S. dollars)

	1977	1978	1979	1980	1981
PBX exchange	NA	NA	NA	61,600	93,500
Telephone sets	68	—	11,000	1,200	3,600
Parts and accessories for electrical line telephonic equipment	NA	29	46,000	23,000	164,409
Speakers	80	7,680	8,123	NA	NA
Amplifiers	850	NA	NA	NA	NA
Parts and accessories for speakers and amplifiers	4,206	8,614	16,783	25,758	58,268
Radio broadcasting transmission and transmission reception apparatus	50,000	NA	NA	550	NA
Cases, cabinets, and parts of artificial materials	90,427	11,736	25,918	6,360	449,691
Parts and accessories for transmission reception apparatus	4,525	NA	8,901	25,758	58,268
Coaxial cables	2,156	NA	2,490	2,845	987
Insulated electric wire cable and telephone cables	696,881	1,445,962	584,849	1,080,515	539,851
TV image and sound recorders and reproducers (magnetic)	NA	6,125	NA	40,000	2,142
Videotapes	NA	616	NA	NA	NA

Source: Colombian Foreign Trade Institute (INCOMEX) Exports Listing #7, January 1977 through December 1981.

Table 5.—Colombia: TELECOM investment plans 1983–1987

(in millions of U.S. dollars)

	1983	1984	1985	1986	1987
Telephone services					
International	20.3	8.0	—	—	—
Intercity	19.8	55.8	35.2	3.8	2.1
Local automatic dial	18.4	40.5	7.0	9.6	24.0
Total	58.5	104.3	42.2	13.4	26.1
Telegraphic and telex services	3.6	7.4	1.0	—	—
Miscellaneous investments	6.5	—	—	—	—
Rural telephony	33.7	19.4	45.0	15.1	1.0
Freight and insurance	2.0	2.2	1.5	.5	.5

Note: Investment plans are valid, but some postponements or delays are expected.

Source: TELECOM—"Ojos y Oidos de Colombia" Bogota, July 1981.

Telecommunications authority.—TELECOM, the autonomous, government-owned PTT, is responsible for all telex, telephone, and telegraph services and international telecommunications facilities not handled by the country's 34 local entities. The Ministry of Communications, which exercises regulatory control over the telecommunications sector, formulates policy and provides technical advice to local operators. Sector priorities and investments are established by the Telecommunications Unit of the National Planning Department, and the Ministry of Finance examines investment and financing plans.

TELECOM discharges its responsibilities through a 10-member board of directors that includes the Minister of Communications as ex officio chairman. The company president is assisted by six vice presidents—for administration, technical operations, rural telephone services, telephone coordination, and financial divisions. Seven regional managers operate in Bogota, Medellin, Barranquilla, Cali, Bucaramanga, Manizales, and Ibague. TELECOM employs a labor force of 19,000.

As of December 1980, some 1,322,285 automatic-dial telephones were in operation, a 6.5 percent increase over the previous year, giving a telephone density of 5.1 per 100. Development plans call for the installation of a further 1,308,100 lines during 1982–87, an average annual growth rate of 12.2 percent. Emphasis will be placed on improving facilities in rural areas, with the anticipated installation of automatic dialing equipment in 4,800 small towns and villages with populations of less than 2,500. In addition, expansion plans call for the installation of some 31,000 half-duplex channels for interurban telephony by 1992.

Other programs for the expansion of telephone facilities during 1983–87 include the acquisition and installation of 125,500 lines and switching equipment for urban services, the purchase of components for outside cable connections, and the procurement of 100,000 private telephone sets and 5,000 for public use, at a total estimated cost of $125 million. In another project, $23 million will be allocated to improve telephone facilities in 16 cities through the installation of new exchanges. Improvements in the long-distance infrastructure will be made in 37 municipalities in the east of the country, and telephone services will be improved or established in 240 rural communities, with 12 of the most important provided automatic telephone and improved telegraph services. Some funding ($22.7 million) for these projects, estimated to cost $35 million, will be provided by the German Government.

Other TELECOM development programs include expansion of telex and datex networks, with 370 sets of time-division multiplex (TDM) equipment and 600 S-DX terminals installed for 7,000 new channels in 18 distribution centers. BIRF-IV-11 complementary radio and multiplex transmission systems to improve microwave links are also planned.

Radio and television broadcasting.—Except for the government-owned and operated Radiodifusora Nacional, radio broadcasting in Colombia is dominated by private enterprise. Some 392 radio stations (1–50 kW) with a total installed capacity of 3 million watts are operating throughout the country. Of these, 60 are now using modulated frequencies.

The Government controls Colombia's three television channels through the Instituto Nacional de Radio y Television (INRAVISION). Broadcasting time is assigned by the Government through public tenders to private companies, and the Government is itself directly involved in educational and cultural programs. INRAVISION is now considering the introduction of private, independent television broadcasting stations and TV cable broadcasting.

About one-third of the budget allocated for broadcasting will be spent on construction of INRAVISION's new headquarters in Bogota. Another third is earmarked for new broadcasting equipment and expansion of modulated frequency facilities for Radiodifusora Nacional, and the remainder for the acquisition of cameras and other equipment for color television broadcasting. INRAVISION also has a budget of $10.7 million for the second phase of a radio and television broadcasting expansion program to extend coverage for the Valle del Cauca, Santander, Narino, and Atlantic coast regions.

Civil aviation and other government organizations.—The Colombian Government has allocated $20 million to the Administrative Department of Civil Aeronautics (DAAC) to upgrade air traffic control and ancillary services through 1986. Planned improvements include the acquisition of control tower equipment, telecommunications and weather equipment, three radar systems, six VOR/DME (omnirange/distance measuring equipment) units, 10 radio beacons, and airfield approach and lighting systems.

Feasibility studies are being done on a telecommunications network for the Ports Services, with results expected in mid-1983. The Direccion General de Aduanas intends to install a telecommunications network, at an estimated cost of $5 million, to improve coordination of customs services throughout the country.

A $4.7 million project is planned to provide telecommunications for the National Health System by installing equipment at 24 sectional headquarters, 108 regional hospitals, and 389 local hospitals, together with 140 mobile units. All external financing for this project has been arranged by AEG Telefunken of Germany.

Commerce and industry.—Carbocol/Exxon plans to invest $55 million for a telecommunications system for the Cerrejon Coal Project. The system will include point-to-point facilities, PABX and PBX systems, mobile radio networks, telex and facsimile facilities, mine airport navigational aids, and railroad operation control equipment.

Expansion of banking in Colombia is proceeding rapidly, with the opening of more than 1,000 branch offices during the last decade. The Farmers' Bank (Caja de Credito Agrario) intends to acquire a radio communications systems for its 900 branches countrywide, and most other large banks and other industrial establishments are implementing modernization and replacement programs.

Marketing Practices

Sales and distribution of imported telecommunications equipment in Colombia are effected through local agents, importers and distributors. At the same time, a good proportion of trade takes place directly with purchasing firms. Many foreign firms also set up branches, subsidiaries, and affiliates within the country. Any deals involving royalty payments and remittances abroad are subject to strict government control. Legal counsel is recommended when drawing up contracts for agency, importer, licensing, and distribution agreements.

Government acquisitions and licensing agreements are regulated by the Official Purchases Statute (Decree 222) issued in February 1983 to supercede the previous 150, with preference shown for local suppliers, taking into account availability, national interests, and costs. Government programs strongly affect the availability of local funding, with interest rates varying between 17 and 48 percent. Financing remains a major factor in the purchase decision.

Technical seminars and trade missions are recommended as the best means of promoting U.S. products. Sponsored visits by Colombian trade missions to the United States also facilitate exposure of U.S. equipment. Such delegations should include engineers, who play a major role in any purchasing decision. For manufacturers offering private telecommunications equipment, the Bogota International Fair held annually in July provides a useful forum, as well as the Compuexpo 83 (March 1–10) and Informatics 83 (October 25–27), all of them taking place in Bogota.

Trade Restrictions

As a member of the Latin American Integration Association (ALADI), Colombia offers concessions on some telecommunications equipment to other member countries. With the inauguration of the new Government in August 1982, changes are anticipated in foreign trade policies.

Within the framework of the Andean Pact, preliminary discussions have been held on the allocation of manufacturing facilities in member countries for various kinds of products. In 1973, the member countries of the pact formed the Andean Development Corporation, which operates as a multinational investment bank.

Within Colombia, imports and exports are controlled through the Colombian Institute of Foreign Trade (INCOMEX). Tariffs of 20–35 percent are imposed on most imports, with a tariff of 50 percent levied on cable. Only cable is subject to import restrictions. In addition, a sales tax of 6 percent is levied on almost all imports.

Import license approvals are required for some radio broadcasting equipment, television sets, and coaxial cable. Products assigned to the free import list (not requiring a license but still subject to customs duties) are determined by INCOMEX on the basis of the extent of local production, national interest, and price comparison. The list generally covers capital and intermediate products. Special contracts can be arranged through INCOMEX for concessional and duty-free imports of goods and raw materials intended for reexport after processing. Global Import Licenses can be issued, valid for 1 year, to facilitate imports used to expand industrial facilities. Full details on all import regulations can be obtained from INCOMEX, Calle 28, No 13A-15, Bogota.

Technical Standards

Most of the CCITT and CCIR standards are in the process of being adopted in Colombia, which is also a member of the International Telecommunications Union (ITU) and INTELSAT. As the responsible body, INCOMEX does not specify particular technical standards for imported equipment, although specifications already established by the Colombian Institute of Technical Standards (ICONTEC) must be met. Details can be obtained from ICONTEC at Carrera 37 No 52–95, Bogota.

Electric power is supplied at 11,200 V for industrial users and 208/120 V at 60 hertz in the secondary distribution system. Metric descriptions are preferred.

Additional Information

The project officer responsible for Country Market Surveys on telecommunications equipment is:

Hayden M. Wetzel
Market Research Division Rm. 2012
International Trade Administration
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-4493

For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-2988

The Survey summarizes a 93-page research report prepared by the U.S. Embassy, Bogota. It reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey as well as the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "Market Survey—Communications in Colombia," ITA 82-04-503, November 1981.

Colombia: Basic Economic Indicators

Population:	28.6 million (1982)
Area:	1,141,748 sq. km.
Administrative units:	22 departments, 3 intendants, 5 commissariats, Bogota Special District
GNP:	$30.58 million (1982)
Contributions to GDP:	Services 59.0% (1982) Industry 18.1% (1982) Agriculture 22.9% (1982)
Per capita income:	$1,215 (1982)
Inflation rate:	24% (1982)
Exports f.o.b.:	$2,649 million (1982)
U.S. share	22%
Imports f.o.b.:	$4,500 million (1982)
U.S. share	36%
Major trading partners:	Japan, United States, Germany, Venezuela, Netherlands, Ecuador, United Kingdom, France
Exchange rate:	70.00 pesos=US$1 (1982)
Fiscal year:	Calendar year
Current account balance:	−$2,370 million (1982)
International reserves:	$4,891 million (1982)
Federal budget	
revenues:	$4.5 billion (1982)
expenditures:	$5.1 billion (1982)
Labor force:	5.5 million (1982)
Unemployment:	9.4% (1979)
Average hourly wage:	$1

Useful Addresses

Embassies

American Embassy
Commercial Section
Calle 37, 8–40
Bogota
tf: 285-1300
tx: 44843

Embassy of Colombia
2118 Leroy Place, N.W.
Washington, D.C. 20008
tf: 387-8338

Telecommunications Administration

Ministerio de Comunicaciones
Edificio Murillo Toro
Carrera 7a. Calle 13
Bogota D.E. 1
Attn: Sr. Secretario General del Ministerio de Comunicaciones
tf: 41 55 32
tg: mincomunicaciones bogota
tx: 44284 minco co

PTT

Empresa Nacional de Telecomunicaciones (TELECOM)
Calle 23, No. 13–49
Piso 8
Bogota D.E.
Attn: Presidente
tf: 42 06 60
tg: telecom bogota
tx: 44280 entp co

Empresa Municipal de Telephones de Barranquilla
Calle 41, No. 41–69
Barranquilla
Attn: General Manager
tf: 414000

Leased lines and data communications

Empresa Nacional de Telecomunicaciones (TELECOM)
Division Commercial
Calle 23, No. 13–49
Piso 7
Bogota D.E.
tf: 234 4340
tx: 44293

Radio broadcasting

Ministerio de Comunicaciones
Edificio Murillo Toro
Carrera 7a. Calle 13
Bogota D.E. 1
Attn: Direccion General de Radiocomunicaciones
tf: 41 55 32
tg: mincomunicaciones bogota
tx: 44284 minco co

Television broadcasting

Instituto Nacional de Radio y Television
(Inravision)
Centro Administrativo Nacional (CAN)
Avenida Eldorado
Bogota, D.E.
Attn: Direccion
tf: 44 67 82
tg: televisora nacional bogota
tx: 44311 inra co

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Technical Standards

Instituto Colombiano de Normas Tecnicas
(ICONTEC)
Carrera 37 No. 52–95
P.O. Box 14237
Bogota
tf: 255 7055
tx: icontec

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CMS/MED/307/83, June 1983

CMS

Country Market Survey

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Medical Equipment

Venezuela

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Despite current financial problems and a radical cut in imports, Venezuela's market for medical equipment is expected to reach almost $100 million[1] in 1986 (see table 1). Until the last months of 1982, American manufacturers of medical equipment had been finding excellent sales opportunities in Venezuela, with U.S. exports increasing by 80 percent from 1978 to 1982 (see table 2). However, declining revenues from oil exports, heavy foreign debts, and persistent capital flight forced the Venezuelan Government to implement austerity measures in 1982. With oil revenues accounting for some 95 percent of export earnings and 75 percent of the budget, the Government reduced the 1982 and 1983 budgets, increased taxes, and reemphasized the "buy Venezuelan" decree. At the end of 1982, import restrictions and a scaling down of the Sixth National Development Plan investments were announced.

About 75 percent of health care services are administered by the Government, which also funds 70 to 75 percent of total purchases. Although a significant number of medium and large projects scheduled for 1982 opening suffered delays or were postponed until the 1983 presidential election year, growth in medical sales continued, due to strong demand for high-technology staples, such as advanced general operating room equipment and hospital laboratory instruments.

Table 1.—Venezuela: Estimated market[1] for medical equipment, by application area, 1980–82, and projected 1986

(in millions of U.S. dollars)

	1980	1981	1982	1986
Cardiological equipment	2.54	2.70	3.1	4.7
Pulmonary apparatus	.97	1.00	1.2	1.5
Neurological equipment	1.41	1.48	1.7	2.0
Ophthalmological equipment	1.37	1.45	1.6	1.9
Pediatric equipment	2.49	2.77	3.1	3.6
Renal equipment	1.80	1.96	2.4	2.8
Operating room equipment	7.51	8.20	9.6	11.0
General hospital equipment	19.65	21.80	24.7	28.0
Clinical laboratory equipment	2.69	2.90	3.3	3.7
Miscellaneous health care equipment	.71	.74	.8	.9
Disposables	16.90	18.60	21.2	29.4
Orthotic and prosthetic equipment	1.61	1.66	1.8	2.1
Architectural, transport, and mobility equipment	3.85	3.96	4.1	4.4
Physical and occupational therapy equipment	.30	.36	.5	.9
Sensory aids and adaptive systems	.39	.42	.5	.5
Total	64.19	70.00	79.6	97.4

[1]Estimated market equals domestic production plus imports (c.i.f.) minus exports (f.o.b.). Values for years through 1980 are given in current dollars, values for 1981 and subsequent years are given in 1980 constant dollars.

Source: Official Venezuelan import statistics, official major exporter country statistics for 1980, and International Trade Administration, Office of Trade Information Services, market research study (see Additional Information box).

General hospitals are the leading buyers of medical equipment, accounting for 54 percent of purchases in 1981 (see table 3). Specialized medical institutions were responsible for 15 percent of 1981 equipment purchases and are expected to maintain that share through 1986. Increases in investment are anticipated by mobile and outpatient centers, which are heavily emphasized in the current National Plan. Military hospitals have been adding equipment at a steep 10-percent average annual pace. Private practitioners are expected to spend more than $17 million in 1986, chiefly for medicines, preparations, and disposables.

Competitive Assessment

All medical equipment used in Venezuela is imported except for a small amount of general hospital equipment and disposables produced by the 10 companies that comprise the domestic manufacturing industry. U.S. firms accounted for 56 percent of all imports and 47 percent of all medical equipment sales in 1980 and are expected to maintain their strong position through 1986 (see tables 4 and 5). Venezuela's geographic proximity allows even smaller U.S. medical equipment manufacturers to direct their attention there, and many such companies have successfully entered the market.

Medical professionals in Venezuela are extremely U.S.-oriented. Although most doctors are educated in Venezuela, many do postgraduate work in the United States. Most doctors speak English, read American medical journals, and attend medical seminars conducted by experts from the United States.

American manufacturers' principal advantage lies in the quality of their equipment, especially in areas of rapid technological change. U.S. high-technology products are considered state-of-the-art in Venezuela, and users place confidence in American designs and production. U.S. makers of pulmonary apparatus and cardiological, pediatric, orthotic and prosthetic, and transport and mobility equipment are expected to continue to provide most of the imports in these product categories. However, in standard product lines, such as most X-ray and operating room equipment, competitors can offer comparable equipment, and price becomes the key factor.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=Bs.4.30 (1979 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 2.—Venezuela: Exports of medical equipment from the United States, 1978–82

(in thousands of U.S. dollars)

	1978	1979	1980	1981	1982	Percentage Change 1978–82	Percentage Change 1981–82
Medical instruments							
Pacemakers	651	853	693	655	269	−58.67	−58.92
Diathermy units	20	4	8	—	2	−89.99	
Ultrasonic therapeutic devices	112	62	135	119	234	108.93	96.64
Other therapeutic apparatus	559	434	977	2,670	2,772	395.89	3.82
Electrocardiographs	463	265	185	273	496	7.13	81.68
Electroencephalographs	14	29	13	29	87	521.43	200.00
Complete patient monitoring systems	819	646	561	904	2,363	188.52	161.39
Electromedical apparatus, NSPF	3,811	3,211	3,781	5,982	9,405	146.79	57.22
Electromedical apparatus parts	437	1,328	1,463	2,280	2,784	537.07	22.11
X-ray tubes	68	150	89	105	133	95.59	26.67
Parts for X-ray tubes	9	38	15	6	190	2,011.11	3,066.67
X-ray apparatus & parts for medical or dental use	3,079	3,849	2,557	5,815	5,606	82.07	−3.58
Radiological apparatus & parts for medical or dental use	788	252	57	221	808	2.54	265.61
Ophthalmic instruments & appliances & parts	956	585	1,411	1,185	1,530	60.04	29.11
Anesthetic apparatus & instr. & pts. (exc. syringes)	367	453	471	803	677	84.47	−15.68
Bougies, catheters, drains, & soundes & parts	1,004	638	1,644	1,588	1,550	54.38	−2.38
Basal metabolism & blood pressure apparatus, & parts	89	56	74	137	225	152.81	64.23
Hypodermic syringes, & parts	72	61	606	951	502	597.22	−47.20
Other syringes, & parts, NSPF	131	116	107	105	257	96.18	144.76
Other medical, etc. instruments & apparatus, & parts, NSPF	5,199	3,363	4,781	6,844	9,245	77.82	35.08
Subtotal	18,648	16,393	19,628	30,672	39,135	109.86	27.59
Medical and hospital appliances and equipment							
Sterilizers & autoclaves & parts	2,003	3,060	2,430	1,360	613	−69.39	−54.92
Wheelchairs, & parts	293	255	373	419	366	24.91	−12.64
Other hospital, medical, dental, etc. furniture, NSPF	1,675	2,300	2,048	4,460	4,925	194.03	10.43
Mechanotherapy appliances & massage apparatus, & parts	232	176	258	902	212	−8.61	−76.49
Artificial respiration, ozone, oxygen, aerosol therapy etc.[1]	2,269	1,754	1,947	—	—	−99.99	
Artificial respiration, NSPF	—	—	—	1,834	2,608		42.20
Hearing aids & parts, NSPF	59	105	107	50	122	106.78	144.00
Bone & joint prosthesis, plates, screws, nails, etc.	337	478	595	451	531	57.57	17.74
Other orthopedic appliances	516	560	1,059	799	1,077	108.72	34.79
Subtotal	7,384	8,688	8,817	10,275	10,454	41.58	1.74
Medical supplies							
Opacifying prep. for radiological exam.	153	208	143	178	380	148.37	113.48
Other diagnostic agents (exc. biological) NSPF	673	710	779	825	1,349	100.45	63.52
Waddings, gauze, dressings, etc. w/medicinals	310	157	23	287	38	−87.73	−86.75
Other waddings etc. NSPF	1,026	751	1,169	1,162	898	−12.47	−22.71
Surgical sutures & materials etc., sterile	1,209	425	304	345	318	−73.69	−7.82
Surgical and medical gloves	166	297	358	296	440	165.06	48.65
Hypodermic needles	47	216	199	442	514	993.62	16.29
X-ray film, medical, exc. dental	378	1,160	2,540	4,096	2,433	543.65	−40.59
Other X-ray film	162	147	207	191	161	−0.61	−15.70
Contact, ophthalmic lenses not mounted	56	61	294	156	226	303.57	44.87
Other ophthalmic lenses	1,506	1,371	2,365	1,595	1,040	−30.93	−34.79
Eyeglass, etc. frames, mountings & parts[2]	182	—	—	—	—	−99.99	
Eyeglass fronts & temples	—	116	30	69	35		−49.27
Parts, NSPF, for eyeglasses, lorgnettes, goggles, etc.	—	68	67	34	147		332.35
Subtotal	5,868	5,687	8,478	9,676	7,979	35.97	−17.53
Total	31,900	30,768	36,923	50,623	57,568	80.46	13.72

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[1] Product category was subdivided in 1981.

[2] Product category was subdivided in 1979.

Source: Compiled from official statistics of the U.S. Department of Commerce, Bureau of the Census.

U.S. firms are most vulnerable to third-country competition in the areas of price and payment terms. Users are also highly critical of specific instances of insufficient technical support from certain firms. Analysts point out the importance of furnishing sufficient support material in Spanish with all technical equipment. Chief competition comes from German, Japanese, and U.K. manufacturers, who supplied 13, 8, and 3 percent of the import market, respectively, in 1980.

Table 3.—Venezuela: Estimated expenditures for medical equipment by major users sectors, 1981 and projected 1986

(in millions of U.S. dollars)

	1980			1986		
	Equipment	Supplies	Furniture	Equipment	Supplies	Furniture
General hospitals[1]	25.9	87.2	7.6	30.6	126.5	15.4
University medical centers	1.2	4.1	.4	1.3	4.3	.5
Specialized medical institutions	7.1	24.1	2.3	9.1	30.0	3.9
Military hospitals	3.3	12.8	1.1	5.4	27.6	2.7
Clinical laboratories	4.3	14.4	1.2	4.9	20.7	1.9
Mobile and permanent health care/population screening centers	3.3	10.2	1.4	8.4	32.3	4.8
Physicians (private practitioners)	2.3	7.2	1.0	2.3	12.6	2.8
Total	47.4	160.0	15.0	62.0	254.0	32.0

[1] Includes general private clinics.

Source: International Trade Administration, Office of Trade Information Services, market research study.

Specific Medical Equipment Markets

Cardiological equipment.—Among the specialized medical products, sales of cardiological equipment are expected to show the highest gain, averaging 11 percent per annum and reaching $4.7 million by 1986. The Government has targeted heart disease, by far the leading cause of death in Venezuela, for particular attention. Health officials plan to step up diagnostic and rehabilitation activities, increasing demand for cardiac output analyzers, intracardiac catheters, electrocardiographs, and defibrillators (see Most Salable Products box).

U.S. manufacturers supplied two-thirds of the market in 1980 and are expected to maintain that share through 1986. Leading suppliers include Kontron, Datascope, Circadian, Cordis, Medtronic, Quinton, Burdick, Hewlett-Packard, Smith Kline, and Varian.

Japanese companies such as Suzuken, Aloka, and San-ei offer cardiological equipment comparable in quality to American products at considerably better prices. Fukuda Denshi, Toshiba, and Nihon Kohden are prominent in electrocardiographs and defibrillators and are starting to market their bedside intensive care systems. Some equipment is also sold by Sonicaid (United Kingdom), Siemens (West Germany), Elscint (Israel), and Remco (Italy).

Pulmonary apparatus.—Increased government spending on treatment of respiratory diseases is expected to boost the market for pulmonary apparatus (especially therapeutic and laboratory equipment) an average 7.5 percent annually from $970,000 in 1980 to $1.5 million in 1986. American manufacturers such as Bird command a strong and growing position in the market, with sales mounting from $740,000 in 1979 (80 percent of the market) to $850,000 in 1980 (88 percent) and projected to reach $1.4 million (93 percent) in 1986. Limited competition comes from Vitalograph Limited (United Kingdom) and Engstrom (Sweden).

Neurological equipment.—The neurological equipment market, after a rapid growth through 1982, is expected to stabilize somewhat for an average annual increase of 6 percent, reaching $2 million in 1986. The Government hopes for a major expansion in outpatient diagnostic services under the Sixth National Plan. Electroencephalographs, electromyographs, and echo encephalographs should be in particular demand.

American suppliers such as Beckman, Codman, and Ohio Medical are expected to increase their market share from 43 percent in 1980 to 50 percent in 1986 with sales approaching $1 million. However, strong competition comes from Japanese firms such as Nihon Kohden, which dominated the electroencephalograph and electromyograph market. It offers comparable equipment at 15 to 20 percent less and provides attractive financing terms. CGR of France has also made significant sales.

Ophthalmological equipment.—The market for ophthalmological equipment is projected to grow at a slow but steady 5.6 percent annual pace, reaching $1.9 million in 1986. The market is heavily dependent on private projects because the Government does not give this area high priority. Demand should be highest for ophthalmoscopes, pupillometers, and laser photocoagulators.

American firms such as Bausch & Lomb are expected to provide $1 million or 53 percent of the 1986 market. Marco (West Germany), Zeiss Jena (East Germany), and Rayner (United Kingdom) are renowned for the quality of their equipment. Nikkon, KTK, Hitachi, and Olympus of Japan offer attractive prices. Other significant vendors include Biomedical of France and Grieshaber of Switzerland.

Table 4.—Venezuela: Imports of medical equipment by country of origin, 1979, 1980, and projected 1986

(in thousands of U.S. dollars)

	1979	1980	1986
Medical and surgical (90.17)			
United States	6,363	5,720	10,500
Japan	1,940	2,258	
Germany	1,763	1,896	
United Kingdom	493	786	
All other	2,437	2,666	
Total	12,996	13,326	27,200
Electromedical apparatus (90.17.04)			
United States	4,544	5,174	9,600
Germany	1,182	1,014	
Japan	655	554	
United Kingdom	218	205	
All other	1,068	943	
Total	7,667	7,890	17,200
Apparatus for mechanotherapy and massage (90.18.01)			
United States	224	145	400
United Kingdom	1	32	
Japan	53	8	
Germany	6	2	
All other	191	34	
Total	475	221	590
Apparatus for psychotechnology (90.18.02)			
United States	17	4	15
Germany	2	—	
All other	—	10	
Total	19	14	30
Respiratory apparatus, masks and similars (90.18.03)			
United States	630	646	1,050
United Kingdom	23	108	
Germany	6	—	
All other	67	40	
Total	726	794	1,250
Parts and pieces (90.18.90)			
United States	121	124	170
Germany	13	—	
All other	117	2	
Total	251	126	300
Apparatus for orthopedics, including medicosurgical girdles (90.19.01)			
United States	587	548	780
Germany	92	36	
United Kingdom	27	4	
All other	29	44	
Total	735	632	1,000
Articles and apparatus for fractures (90.19.02)			
United States	302	666	1,250
Germany	78	176	
United Kingdom	152	132	
All other	50	354	
Total	582	1,328	2,300
Prosthetic apparatus (90.19.03)			
United States	127	118	170
Germany	27	92	
United Kingdom	3	—	
All other	7	2	
Total	164	212	300
Hearing aids (90.19.04)			
United States	154	102	150
Germany	17	2	
All other	201	138	
Total	372	242	360
Others (90.17.89)			
United States	884	1,106	1,800
Germany	2	—	
United Kingdom	3	—	
All other	45	10	
Total	934	1,116	2,000
X-ray apparatus (90.20.01)			
United States	2,971	1,698	3,200
Germany	2,504	1,528	
United Kingdom	580	38	
Japan	401	132	
All other	1,667	3,602	
Total	8,123	6,998	12,000
Other respiratory apparatus (90.20.89)			
United States	595	1,072	1,550
Germany	301	304	
United Kingdom	31	2	
Japan	2	12	
All other	238	458	
Total	1,167	1,848	2,600
Parts and pieces (90.20.90)			
United States	445	538	750
Germany	157	54	
Japan	15	2	
United Kingdom	8	—	
All other	242	138	
Total	867	732	1,100
Thermometers (90.23.02)			
United States	14	1	10
Japan	145	3	
All other	47	—	
Total	206	4	100

Pediatric equipment.—U.S. firms are extremely powerful in the pediatric equipment area, supplying 82 percent of the equipment purchased in 1980 and forecast to provide over $3 million of the $3.6 million market in 1986. Companies already active in the market include Air Shields, Inc., Ohio Medical, and Berkeley. Perinatal, infant, and preschool mortality are singled out as special concerns under the Sixth Plan, which should boost sales of portable intensive care, intermittent positive pressure resuscitation, and tent systems.

Table 4.—Venezuela: Imports of medical equipment by country of origin, 1979, 1980, and projected 1986 (Cont.)

(in thousands of U.S. dollars)

	1979	1980	1986
Pyrometers (90.23.03)			
United States	87	50	100
Germany	4	16	
United Kingdom	1	6	
All other	15	30	
Total	107	102	150
Instruments and apparatus for physical and chemical analysis; for tests of viscosity, porosity, distension, superficial tension, and the like; for calorimetric, photometric, or acoustic measurements; microtomes (90.25.01)			
Unites States	6,434	4,444	6,800
Germany	385	446	
United Kingdom	194	204	
Japan	131	48	
All other	728	496	
Total	7,872	5,638	8,500
Parts and pieces (90.25.90)			
United States	1,318	816	1,550
Germany	64	98	
United Kingdom	70	12	
Japan	1	12	
All other	163	50	
Total	1,616	988	2,050
Medicosurgical furniture, dentist chairs (94.02.01)			
United States	1,256	1,430	2,500
Japan	546	671	
Germany	138	152	
All other	712	667	
Total	2,652	2,920	4,600
Other (94.02.89)			
United States	119	92	120
Japan	31	35	
All other	121	103	
Total	271	230	300
Parts and pieces (94.02.90)			
United States	26	18	35
Japan	50	28	
All other	12	4	
Total	88	50	100

Source: Official Venezuelan import statistics and market research study estimates.

Renal equipment.—Private purchasers are more significant than government buyers in the fast-growing renal equipment market; thus, maintenance and credit terms are crucial to the purchase decision. Sales are projected to advance from $1.8 million in 1980 to $2.8 million in 1986. American manufacturers, including General Electric and Liebel-Flarsheim, captured 43 percent of the market in 1980. Third-country rivals boast both excellent reputations and good financing terms. Market leaders include Cyprane Limited (dynamic urological systems) and Eschmann of the United Kingdom, Casa PI-RO (Argentina), and Engstrom (dynamic urological systems) and Gambro (dialysis apparatus) of Sweden.

Operating room equipment.—U.S. manufacturers such as Affiliated Hospital Products, Ohio Medical, Lawton, Foregger, Valleylab, and North American Drager are major suppliers of operating room equipment, holding 64 percent of the $7.5 million market in 1980. When the current financial crisis abates, U.S. firms can look forward to a market expanding to $11 million by 1986 and accounting for 11 percent of the total medical equipment market. Government sponsorship of new hospital construction and renovation has fueled demand for electrosurgical units, anesthesia equipment, catheters, suction equipment, and surgical lighting, tables, and instruments.

High-quality operating room instruments are bought from West German manufacturers including Aesculap Werke, Diener, Martin, Marco, Dimeda, and Medicon. Mizuho, Kamiya, and Sakura of Japan have won a share of the market for operating room lamps and tables by underselling the competition. Other notable third-country suppliers include Skylux, KTK, and Topcon of Japan; Takaoka and Olidef of Brazil; and Gambro.

General hospital equipment.—General hospital equipment accounted for $20 million or 29 percent of the medical equipment market in 1980. Sales have continued to grow at a rapid pace through 1982, spurred by government funding of new hospitals and refurbishing of old ones. While hospital construction has been drastically reduced following budget cutbacks this year, renewed activity may be expected by the end of 1984.

Imports account for some 83 percent of purchases and include substantial quantities of gamma scintillation cameras, ultrasonic scanners, bedside monitoring systems, X-ray equipment, and furniture, especially beds. About 44 percent of imports come from such U.S. firms as American Hospital Supply, Affiliated Hospitals Products, Sybron, J.D. Marshall, Market Forge, Southern Cross, Pharmaseal, Abbott Laboratories, General Electric, Wolf Corporation, Chemetron Universal, Picker, and Welch-Allyn. Riester, Storz, and Heine of West Germany supply large amounts of diagnostic equipment.

Siemens gets top grades for its high-quality X-ray equipment and its maintenance record. GE (Spain) and CGR (France) are also active in the X-ray equipment market. Olympus furnishes large amounts of diagnostic equipment, and San-ei is successfully marketing inexpensive bedside monitoring systems. Other suppliers include Sugiyama, Aloka, and Sakura of Japan; Atomic Energy of Canada; and Fridesa and Crisa of Spain.

Table 5.—Venezuela: Estimated imports of medical equipment, by application area, 1979, 1980, and projected 1986

(in thousands of U.S. dollars)

	1979		1980		1986	
	Total Imports	From U.S.	Total Imports	From U.S.	Total Imports	From U.S.
Cardiological equipment	1,937	1,210	2,540	1,670	4,700	3,100
Pulmonary apparatus	918	739	970	850	1,500	1,400
Neurological equipment	1,118	386	1,410	600	2,000	1,000
Ophthalmological equipment	1,210	510	1,370	580	1,900	1,000
Pediatric equipment	3,147	2,374	2,490	2,030	3,600	3,100
Renal equipment	1,658	728	1,800	780	2,800	1,400
Operating room equipment	5,846	3,936	7,510	4,770	11,000	7,700
General hospital equipment	14,112	5,846	16,260	7,220	23,200	10,200
Clinical laboratory equipment	2,936	1,532	2,690	1,380	3,500	1,900
Miscellaneous health care equipment	773	409	710	400	900	600
Disposables	6,261	2,621	9,900	4,500	18,200	6,300
Orthotic and prosthetic equipment	2,736	1,783	1,610	1,220	2,100	1,750
Architectural, transportation, and mobility equipment	3,058	2,679	3,850	3,740	4,400	3,600
Physical and occupational therapy equipment	482	233	300	200	900	500
Sensory aids and adaptive systems	398	218	390	180	500	300
Total	46,590	25,204	53,800	30,120	81,200	43,850

Source: Official Venezuelan import statistics, official major exporter country statistics for 1979 and 1980, and market research study estimates.

[1]Values for years through 1980 are given in current dollars, values for 1981 and subsequent years are given in constant dollars.

Clinical laboratory equipment.—New government installations have supported a steady 5-percent average annual growth in the clinical laboratory equipment market and sales reaching $3.5 million in 1986. All equipment is imported, with the greatest demand expected for centrifuges, liquid chromatographs, spectrophotometers, flame photometers, automated sample analyzers, and blood cell counters.

U.S. firms supply better than half the market and are forecast to maintain their sizable lead. Becton Dickinson, Bio-Dynamics, Clay Adams, Varian, Orion Research, Du Pont, and Corning are all well known.

Sterilizers and incubators sold by Melag, Aesculap, and Memmert of West Germany are expensive but regarded as worth the price. Olympus and Nikkon are leading suppliers of microscopes, and Grant of the United Kingdom is active in the sterilizer, autoclave, and distiller market. Other important suppliers include Damon and Jencon's of the United Kingdom and Boekel of West Germany.

Miscellaneous health care equipment.—Sales of miscellaneous health care equipment are projected to rise from $710,000 in 1980 to $900,000 in 1986. All items are imported, with U.S. firms such as General Electric supplying more than 50 percent. Chief third-country competition comes from Siemens and CGR.

Disposables.—The market for disposables has been showing remarkable advances, climbing from virtually nothing in 1976 to $16.9 million in 1980. Disposables are now commonplace in both public and private facilities, and any new product developed abroad quickly finds its way to Venezuela. Sales are expected to continue rising by 9.7 percent annually to almost $30 million in 1986, stimulated by high labor costs and shortages of skilled personnel. However, Venezuelan buyers are expected to become highly price-sensitive regarding disposables. Strong demand is predicted for sterile tracheal tubes, prepared trays, single-use thermometers and oxygen masks, disposable thoracic catheters, syringes, needles, gauze, dressings, surgical sutures, and gloves.

About 40 percent of the market is supplied by domestic manufacturers. Inyectoplas Venezolana C.A. produces some 24 million disposable syringes a year, as well as serum infusion equipment and pericraneal devices. Weplast C.A. makes approximately 25 million disposable syringes a year and exports about 25 percent of its output to the Caribbean and the Andean Pact nations.

Many U.S. firms are active in the market, notably American Hospital Supply, Becton Dickinson, C.R. Bard, Argyles, Burron, Mars, Kendall, Perry, Seambles, Abbott Laboratories, and Johnson & Johnson. American manufacturers supplied almost 46 percent of the imported disposables in 1980, but increased competition from domestic manufacturers and less expensive Japanese products are expected to reduce their share to 35 percent by 1986. Terumo and JMS (Japan) products are competitive in quality with U.S. supplies but generally sell for 20 percent less.

Portex Limited and Eschmann (United Kingdom) have moved into the disposable market, joining Willy Rusch, Aesculap Werke, and B. Braun of

West Germany; CHR Bardram of Denmark; Lapro of South Africa; Syrutex of Colombia; and Adex of Mexico.

Aids to the handicapped.—Medical rehabilitation for the physically handicapped is one of the goals of the Sixth National Plan, and the Government is expected to increase its purchases of products such as artificial organs, implantable pacemakers, prostheses, orthoses, and wheelchairs. Altogether, sales of these items are projected to go from $6.2 million in 1980 to almost $8 million in 1986. Virtually the entire market is supplied by imports, with nearly 90 percent coming from U.S. companies in 1980. However, this share is expected to drop to less than 80 percent by 1986 as local manufacturers begin making transport and mobility equipment. American firms already active in Venezuela include Ferno Washington, Ille Electric, Therm-o-Rite, OEC, Melody, Graham Field, Invacare, Willco, Maico, and American Medical Systems.

Health Care System

Under the current National Plan, the Government intends to increase health care expenditures an average 9.7 percent annually to $2.1 billion in 1985. Most of the new funds will be channeled through the Ministerio de Sanidad y Asistencia Social (MSAS—Ministry of Health and Social Assistance), the major Federal agency dedicated to the health and well-being of the nation's population (see table 6).

Table 6.—Venezuela: Health care expenditures by principal government entities, Sixth National Plan, 1981–85

(in millions of U.S. dollars)

	1981	1982	1983	1984	1985
MSAS[1]	905	1,178	1,226	1,319	1,394
IVSS[2]	411	432	453	476	499
JBPDF	85	92	102	110	118
IPASME[3]	41	48	57	69	82
Military Health	36	39	42	46	50
Total	1,478	1,789	1,880	2,020	2,143

[1] Excluding its autonomous institutes, but including buildings to be built by the Ministerio del Desarrollo Urbano.

[2] Includes its health care activities.

[3] Instituto de Prevision y Asistencia Social del Ministerio de Educacion (Institute for Social Assistance and Welfare of the Ministry of Education).

Source: "VI Plan de Desarrollo de la Nacion, 1981–1985 (Version Final)," Cordiplan.

MSAS runs the government health activities through its general health commissions in each State. The commissions administer hospitals, rural medical centers, outpatient facilities, dispensaries, and service modules. The Ministry also performs public health functions, conducts participative and preventive medicine educational programs, and carries out programs to eradicate rural diseases. Several autonomous institutes report to MSAS, including the Institute for Scientific Research and the National Nutritional Institute. All health projects, public and private sector, must be approved by MSAS.

In 1979, MSAS operated 145 hospitals with a total of 23,800 beds, 58 percent of the national total. Its budget for that year was $725 million.

The second most important government health organization, the Instituto Venezolano de los Seguros Sociales (IVSS—Venezuelan Institute for Social Insurance), is an autonomous institute reporting to the Ministry of Labor. It provides health care services for its 2,350,208 (in 1980) insured workers and operates 18 hospitals that provide 8 percent of the country's beds. IVSS is relatively self-sufficient financially. Total 1980 expenditures were some $785 million.

The Ministry of Defense furnishes health care services for armed forces personnel. In 1979, it ran a series of outpatient facilities as well as five hospitals with 1,253 beds; one hospital—the Hospital Militar in Caracas—has 1,050 beds.

State Governments no longer play a significant role in health care. In 1970, around 60 hospitals with over 2,600 beds were under the administration of state authorities, but these are being gradually passed over to MSAS, and by 1979, only 5 establishments with 224 beds remained under state control.

Only one municipality participates actively in health care in Venezuela. The municipal council of the Federal District under its social service organization JBPDF (the Junta de Beneficencia Publica del Distrito Federal) operates 15 hospitals with 2,826 beds and several emergency and outpatient services.

In the private sector, medical facilities are operated by profitmaking and nonprofit institutions and major industries. Almost 8,000 beds, 20 percent of the country's total, were administered by the 239 profitmaking institutions in 1979. These hospitals vary tremendously in size, specialty, and quality and include some modern, technologically advanced, and very expensive facilities. The largest of these institutions have over 100 beds and the smallest as few as 3. Five large (300–400 beds) private hospitals, at a minimum, are slated to open within the next few years. Plans for four more are under discussion.

The nonprofit segment consists of more than 20 different organizations and is particularly strong in outpatient services of various kinds. Eight nonprofit hospitals were run by the Red Cross and various Catholic orders in 1979.

Seven of the 11 industrial hospitals are operated by the petroleum/petrochemical companies. Together they account for 406 beds. An estimated

300 other industrial establishments have facilities for treating job-caused emergency health problems.

Venezuela on the whole suffers from a shortage of hospital beds. The country averages 2.5 beds per 1,000 residents. Another 7,254 beds are needed to bring the ratio up to the World Health Organization's (WHO) norm of 3 beds per 1,000. Regionally, the availability of beds varies widely. The Caracas and Zulia regions meet the WHO standard, but there are acute shortages in rural areas. Venezuela's population is expanding at the very high annual rate of 3.25 percent, making the need for new hospital beds even more urgent.

In 1978, Venezuela had 14,771 doctors, an average of 1 doctor per 1,045 individuals. Again, the ratio varies widely geographically—44 percent worked in the Caracas area, giving Caracas a ratio of 1 doctor per 633 residents, while the rural Plains region had only 339 doctors, or 1 per 1,960 individuals. In 1980, there were 8,805 nurses, or 1 per 1,736 inhabitants, and 28,904 nursing auxiliaries, or 1 for each 534 residents.

However, the most serious medical personnel problem is an acute shortage of trained technicians caused by a lack of in-country specialized training courses and inadequate incentives. As with hospital beds and doctors, the shortage is most critical in rural regions.

The Government planned an ambitious expansion of health care under the Sixth National Plan, 1981–86. Around $1.2 billion was earmarked for construction projects that would add 13,055 new beds to the public sector. This, along with the 1,648 new private beds already approved, would raise the ratio to 2.7 beds per 1,000. Most of the new beds, however, were destined for the Caracas and Zulia regions, not the bed-short rural areas. All new public hospitals will have fewer than 300 beds, based on the theory that larger institutions breed inefficiency.

Particular emphasis is placed on outpatient facilities (as opposed to hospitals) under the Plan. Many properly equipped new institutions of this kind will be added, while existing units will be improved; hospitals will be restricted to the seriously ill. All outpatient facilities will be linked to specific hospitals.

The Ministerio del Desarrollo Urbano (MINDUR—Ministry of Urban Development) is responsible for all MSAS and IVSS construction projects. Private construction firms under contract to MINDUR are responsible for the construction of the building and the purchase and installation of fixed equipment such as X-ray equipment and operating room furniture. MSAS and IVSS, however, are responsible for the purchase of items such as monitors and cardiology, resuscitation, and laboratory equipment. In addition to MINDUR projects, the Ministry of Defense has contracted for three new hospitals and four outpatient centers.

Market Access

The majority of medical equipment is marketed through 45 large importers/stocking distributors/agents that are members of the Associacion Venezolana de Distribuidores de Equipos Medicos (AVEDEM). Siemens and 3M of the United States have subsidiaries in AVEDEM, but most members are Venezuelan enterprises. Some 15 percent of the products are distributed through 150 to 170 smaller agents. An additional 10 to 15 percent are imported directly.

For government purchases, price and rapid delivery are most important. For private sector purchases, however, quality and credit are the crucial elements, and quality includes servicing.

Trade Regulations

Trade restrictions.—Venezuelan customs duties on imports are based on the classifications of the Brussels tariff nomenclature (BTN) as modified by the Andean Common Market. Customs duties are based on the c.i.f. value; very occasionally, duties are also levied on the gross weight of an item. Import licenses (granted by the Ministerio de Fomento—the Development Ministry) are sometimes required when competing with domestic production. Components used by domestic manufacturers are sometimes granted duty exonerations or reductions by the Ministerio de Fomento.

Venezuelan tariffs fall under two different categories: general duties and Andean Pact duties, the latter to be gradually eliminated. In addition to the customs duty, a 3.5 percent ad valorem tax is levied on all imports, replacing former consular fees. A further 2 percent is levied on all items imported by parcel post or air freight.

U.S. exporters should obtain the latest information on the frequently changing import and currency restrictions imposed by the Venezuelan Government since the financial crisis began.

Technical requirements.—There are no official standards to which medical equipment is obliged to conform in Venezuela. The standards of the major supplier countries—the United States, West Germany, and Japan—are all readily accepted. The government organization that regulates standards is the Comision Venezolana de Normas Industriales (COVENIN).

Electric utilities generally distribute 120/240 volt single phase and 480 volt 3 phase current at 60 cycles. Electricity is available in practically all inhabited areas.

Most Salable Products

Cardiological Equipment

- Cardiac ouput analyzers
- Intracardiac catheters
- External pressure circulatory assist systems for myocardial infarcts
- Bedside intensive care systems
- Electrocardiographs
- Defibrillators

Pulmonary Apparatus

- Equipment for diagnosing lung perfusion
- Spirometers
- Positive pressure breathing apparatus
- Volume-controlled breathing apparatus
- Resuscitation equipment
- Nebulizers

Neurological Equipment

- Electroencephalographs
- Electromyographs
- Echo encephalographs

Ophthalmological Equipment

- Ophthalmoscopes
- Pupillometers
- Laser photocoagulators

Pediatric Equipment

- Portable intensive care systems
- Tent systems (nebulizer, refrigeration unit, canopy)
- Intermittent positive pressure resuscitation systems

Renal Equipment

- Recirculating single pass dialysis systems
- Regenerating dialysis systems
- Urodynamic systems

Operating Room Equipment

- Electrosurgical units
- Anesthesia equipment
- Catheters
- Suction equipment for use with vacuum piping systems
- Anesthetic gas evacuation systems
- Surgical lighting
- Surgical tables
- Surgical instruments

General Hospital Equipment

- Gamma scintillation cameras
- Ultrasonic scanners
- Bedside patient monitoring systems
- Portable resuscitation/inhalator/aspirator units
- Oxygen flowmeters
- A wide variety of X-ray equipment
- Hospital furniture, especially beds

Clinical Laboratory Equipment

- Centrifuges
- Automated sample analyzers
- Liquid chromatographs
- Spectrophotometers (ultraviolet and visible light)
- Flame photometers
- Automated blood cell counters

Disposables

- Sterile tracheal tubes
- Basic biopsy trays
- Shave preparation trays
- Single-use oral thermometers (centrigrade scale)
- Single-use oxygen masks
- Disposable thoracic catheters
- Disposable gastric feeding units/bags
- A wide range of disposable items for operating room service
- Disposable syringes and needles
- Gauze and dressings
- Surgical sutures
- Surgical and medical gloves
- Disposable monitoring electrodes

Orthopedic, Prosthetic, Transport, and Mobility Equipment

- Artificial organs
- Implantable pacemakers
- Prostheses and components
- Orthoses and components
- Wheelchairs and similar devices

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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The Survey summarizes a 112-page research report prepared by Ronai y Associdos of Caracas, Venezuela, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Medical Equipment—Venezuela," ITA 81-09-500.

Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in Venezuela and trade statistics compiled by the Department of Commerce's Bureau of the Census.

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Telecommunications Equipment

Chile

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Until the onslaught of the recession late in 1981, the Chilean market for telecommunications equipment had grown strongly, with 1981 sales of almost $83 million[1] reflecting the country's overall economic progress (see table 1). GDP increased at an average annual rate of 8 percent between 1977 and 1981, and new telephone service grew at about 6 percent annually during this period. Demand for telephones lessened considerably in 1982, however, as the economy went into a steep decline, with GDP falling 14.3 percent.

The telephone industry, which accounts for about 80 percent of Chile's telecommunications market, is expected to be flat in 1983, in line with projections for the rest of the economy. Growth is likely to resume in 1984, however, as recovery begins. The most important areas of future development will probably involve telephony: automatic telephones for rural areas, residential telephones, mobile telephone, small FM radio transmitters outside the metropolitan areas, TV circuits, and dedicated circuits.

The Chilean Government's free market policies permit imports to enter the country without restriction (see table 2). Moreover, government-owned firms make equipment purchases on a nondiscriminatory basis. The telecommunications equipment market consists almost entirely of imports, and few local manufacturers remain competitive under free market conditions. U.S. telecommunications equipment manufacturers enjoy an excellent reputation for high standards of technology and quality, reliability in delivery dates, and a broad range of products.

Table 1.—Chile: Total market
(in thousands of U.S. dollars)

	1981	Estimated 1982	Forecast 1987
Telephone and telex equipment	64,955	19,000	80,000
Transmission equipment	3,663	4,800	5,000
Mobile radio	2,093	1,400	2,000
Video and audio broadcast equipment	8,529	3,900	10,000
Data communications equipment	3,475	3,700	5,000
Total market	82,715	32,800	102,000

Source: U.S. Foreign Commercial Service, Santiago, Chile, report, "Market Survey: Telecommunications Equipment—Chile," December 1982.

Table 2.—Chile: Imports of telecommunications equipment by country of origin, 1980-82
(in thousands of U.S. dollars)

	1980	1981	January-October 1982
Telephone apparatus (CCCN (85.13)			
United States	52	2	—
Japan	122	—	12
Germany	55	—	—
Spain	37	7	—
Korea	—	64	—
Others	44	16	11
Total	310	89	23
Telephones (85.13)			
United States	1,563	1,311	292
Japan	1,356	919	1,569
Spain	98	282	219
Germany	174	245	42
Hong Kong	116	51	—
Others	1,906	449	180
Total	5,213	3,257	2,302
Manual exchanges (85.13)			
United States	21	11	6
France	7	—	61
Sweden	—	28	32
Germany	6	18	18
Japan	51	48	8
Canada	345	—	7
Spain	—	9	4
Total	430	114	136
Automatic exchanges (85.13)			
United States	2,289	4,380	737
Israel	1,633	124	1,028
France	415	33,836	548
Canada	416	783	266
Japan	1,620	1,956	225
Sweden	39	3,237	100
Germany	598	1,117	9
Brazil	189	858	4
Korea	286	64	—
Others	115	989	153
Total	7,600	47,344	3,070

Source: U.S. Department of Commerce, Foreign Commercial Service, American Embassy Santiago, report, "Market Survey: Telecommunications Equipment—Chile," December 1982, and desk research.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=39 pesos (1980 and 1981), and 46 pesos (1982 and subsequent years). Values through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1982 constant dollars.

Table 2.—Chile: Imports of telecommunications equipment by country of origin, 1980-82 (Continued)

(in thousands of U.S. dollars)

	1980	1981	January-October 1982
Electronic exchanges (85.13)			
United States	—	—	611
Israel	—	—	169
Japan	—	—	39
France	—	—	34
Spain	—	—	25
Italy	—	—	20
Others	—	—	37
Total			935
Telegraph equipment-teleprinters (85.13)			
United States	1,478	760	1,638
Germany	1,255	1,206	800
Italy	64	344	313
France	35	253	88
Sweden	—	104	8
Mexico	473	401	—
Japan	114	110	—
Others	69	297	200
Total	3,488	3,475	3,047
Telecommunications equipment-carriers (85.13)			
United States	160	231	260
Italy	25	509	587
Canada	130	—	203
Japan	1	6	15
Brazil	60	309	—
Spain	—	288	—
South Africa	—	112	—
Others	79	—	50
Total	455	1,455	1,115
Parts and pieces for telephone equipment (85.13)			
United States	1,912	1,643	560
Germany	432	434	1,136
France	201	138	1,063
Spain	333	163	184
Japan	66	94	142
Canada	88	210	126
Mexico	59	726	116
Sweden	78	107	48
Italy	50	46	42
Belgium	274	355	32
Others	311	497	56
Total	3,804	4,413	3,505
TV and radio communications equipment (85.15)			
United States	391	205	—
Japan	11,690	783	2
Taiwan	3,543	62	1
Panama	2,288	—	—
Korea	1,092	—	—
Brazil	245	—	—
Hong Kong	27	67	—
Others	127	21	—
Total	19,403	1,138	3
Radiotelephony and telegraphy—telex equipment (85.15)			
United States	6,526	4,528	1,876
Japan	1,797	3,235	1,369
Italy	40	298	266
Canada	64	140	95
Germany	77	175	93
Taiwan	55	179	58
Spain	23	740	49
Denmark	53	91	47
Australia	1,131	60	29
France	45	84	3
Brazil	101	3	—
Austria	71	9	—
Others	129	196	134
Total	10,112	9,738	4,019
Radio and TV broadcast equipment and radio and TV studio equipment (85.15)			
United States	4,293	3,121	1,133
Japan	1,369	3,773	1,072
United Kingdom	—	351	267
France	43	—	81
Germany	49	18	73
Netherlands	81	59	51
Belgium	197	10	—
Others	75	59	505
Total	6,107	7,391	3,182
Communication test instruments (90.28)			
United States	1,285	1,983	2,239
Germany	458	540	375
Japan	399	418	226
France	73	51	176
Switzerland	58	45	138
Spain	87	76	69
United Kingdom	21	81	50
Italy	7	119	12
Netherlands	24	94	8
Others	139	186	139
Total	2,551	3,593	3,432
Telephone cable and wire (85.23.02)			
United States	192	503	295
Spain	—	54	118
France	—	16	64
Taiwan	86	63	28
Germany	10	10	19
Brazil	17	32	8
Israel	7	28	7
Others	40	2	33
Total	352	708	572

Source: U.S. Foreign Commercial Service, Santiago, Chile, report, "Market Survey: Telecommunications Equipment—Chile," December 1982.

Chile's relatively modern telecommunications network involves primarily two large government-owned operating companies, the Compania de Telefonos de Chile (CTC) and Empresa Nacional de Telecomunicaciones (ENTEL-Chile). The Government expects both to operate at a profit. In addition, several private telephone companies have recently been formed.

The Ministry of Transport and Telecommunications' Subsecretariat of Telecommunications regulates all telecommunications systems, serving essentially a technical role, and specifically allocates radio frequencies and licenses, and supervises the operation of more than 18,000 citizen band radios, all of several hundred radio broadcasting stations, TV broadcasting stations, and more than 4,100 amateur radio stations. The Subsecretariat also serves as the Chilean representative to the International Telecommunications Union.

The 1982 telecommunications law defining the sector in Chile and officially opening it to private-sector involvement regulates concessions, permits, rates, and technical standards. The law's influence is similar to the activities of the U.S. Federal Communications Commission.

The Government intends to withdraw gradually from direct operating responsibility in part of the telecommunications sector, and meeting the national goal for 1990 of 14 telephones per 100 inhabitants will require private investment. Chile's free market orientation dictates that CTC and Telex-Chile, which provides telegraphic services, be spun off to the private sector. Privatization would come about from international bids for the companies' shares.

Telephone Companies

Empresa Nacional de Telecomunicaciones S.A. (ENTEL-Chile) was established in 1964 to build and operate a transmission system for the nation's telephone, telegraph, telex, radio, television, and data communications programs. An autonomous state-owned enterprise (99.27 percent of its shares are held by CORFO), ENTEL maintains a solid infrastructure and a policy of constant development.

ENTEL-Chile's domestic microwave network has a reliability of 99.8 percent, "excellent" by international standards, as is the performance of its satellite communications circuits. Longovilo 2 (one of its earth stations) was rated first in reliability among INTELSAT's stations throughout the world, and Longovilo 1 was rated fourth. ENTEL has just inaugurated a third antenna at Longovilo.

A complete range of long-distance services for the entire country is available through ENTEL's primary network. Direct dialing for international telephone calls will be in effect in mid-1983. When ENTEL started operations in 1965, it had only 42,800 kilometers of working circuits; this figure has now reached 1.2 million kilometers (see table 3).

ENTEL has just replaced its obsolete shortwave system for long-distance communication with modern microwave systems, also utilizing extensively its relay stations. ENTEL called for bids during 1981 for an international traffic-switching system to increase future international telephone service. The Swedish firm L.M. Ericsson was selected to install this equipment.

International telephone service, which accounts for more than 80 percent of ENTEL's operations, has grown at an average of 22.8 percent during

Table 3.—Chile: National telecommunications network, 1982
(all figures in units of equipment or U.S. dollars)

Number of telephones	599,728	
Business	209,905	
Residential	389,823	
Mainstations	407,606	
Mainstation waiting list	225,000	
Number of lines		
Main	407,606	
Toll truck	2,253	
International trunk	258	
Number of exchanges		
Local		
Manual/electro-mechanical	248	
Analog electronic	2	
Digital electronic	4	
Number of telephone calls		
Local	18.3	per service line
Toll	0.3	per service line
International	18,571,916	chargeable minutes
Number of telex switches	4,000	
PTT		
Total employees (telecommunications only)	13,000	

Source: Ministry of Transport and Telecommunications, Subsecretariat of Telecommunications.

the past 5 years, and is expected to maintain this pace in the near future. At the end of 1981, ENTEL-Chile was operating 259 international telephone channels, including 60 to the United States, 52 to Argentina, 51 to European countries, 48 to other South American nations, and the remainder to Canada, the United Kingdom, and Central America. (The balance of ENTEL's 293 international channels, of which 248 correspond to satellite circuits, are assigned to telegraph, data communications, and facsimile operations.)

Increasing demand for international telephone service through the land microwave link between Santiago and Mendoza, Argentina, will require a sizable investment in modern equipment, which could be made either by ENTEL-Chile or by a private firm interested in this line of business. During the second half of 1981, ENTEL's transition from satellite primary step to INTELSAT VI. took place. With INTELSAT, Chile has three international transmissions, one to America in general and two to Europe. International telephone traffic through CTC and other private operators totaled more than 22 million minutes, with outgoing traffic acounting for 9.8 million minutes. Television transmission time during 1981 through satellite was 31,506 minutes.

Compania de Telefonos de Chile (CTC), the result of the merger of several small telephone companies, was owned and operated over a period of time by International Telephone and Telegraph (ITT). The Chilean Government in the late 1960s, after financing a special telephone development program, became part owner of the company. During Salvador Allende's socialist regime (1970-73), the Chilean Government nationalized CTC, and in 1974, the new Government negotiated the purchase of the company with ITT. A small amount of private capital is also invested, which the Government would like to increase to a two-thirds share, keeping one-third of CTC in government hands so that its Corporacion de Fomento de la Produccion (CORFO) would maintain control.

CTC provides local telephone service through 386,706 exchanges, and by the end of 1983, a total of 574,725 telephones will have been installed. Metered service is used in Santiago, Valparaiso, Vina del Mar, and Concepcion (259,220 lines), and other automatic services account for 60,025 lines. Central battery-operated lines number 15,649, and the magnet system has 15,812 lines. CTC also operates coin-operated public phones.

CTC's Distant Direct Dialing (DDD) capability in Santiago and the rest of the country except Arica, Los Andes, and small and remote areas has allowed a simultaneous increase in the number of long-distance calls and decrease in their cost, which with direct dialing amounts to 10 percent of the operator-assisted price. Long-distance and telephone calls are made primarily through ENTEL-Chile's satellite communications earth station located at Longovilo (near Santiago) and a land microwave link between Santiago and Mendoza, Argentina.

During 1980 CTC signed a turnkey contract with Thomson-CSF (France) for installation of a large telecommunications network consisting of 27 MT 35, numerical multiplex, and joint numerical and analog telephone exchanges. The MT telephone exchanges, which represent the major part of the contract, will be manufactured in France and installed in Santiago, Valparaiso, Talca, and Concepcion. Four of the operation exchanges and maintenance shops, four assessment retransmission devices, and one maintenance center will also be installed in these cities. The complete network will be in operation during 1984. External implementation of the network, including cables, pressure equipment, coils, and distribution boxes, was assigned to a Chilean firm, MADECO S.A., in 1981. This firm manufactures copper cables and serves as a distributor and agent for several U.S. and European firms through its affiliate, MADECO Telecomunicaciones. The construction of buildings to house the new digital equipment was started in 1982, and massive training in operating the new system is being given in France and Chile.

Construction of the local observation center was also initiated in 1982. In addition, turnkey contracts with Porta Systems were signed for a complete "automatic center for supervision and detection of failures," designed to reveal telephone failures promptly.

Compania Telefonica Manquehue in the past 2 years has installed more than 5,000 telephone lines in Las Condes, Vitacura, and Barnechea (Santiago's residential sectors). The firm's stated goal is to install up to 35,000 lines over the next 2 years.

Complejo Manufacturero de Equipos Telefonicos (CMET) has already installed more than 2,000 telephones in Providencia (one of Santiago's busiest commercial sectors as well as a residential area) and 500 in Renaca, Vina del Mar, and Concon (summer resorts near Santiago). It plans to install another 500 telephone lines in the city of Quilpue, also near Valparaiso. CMET has an ambitious and innovative special services program, which features concurrent installation of a telephone and an information terminal. The terminal, a typewriter with an attached screen (CRT), is designed for home use and comes with 14 computed information programs on weather, tourism, hotels, flight schedules, supermarket prices, TV programs, medical services, economical indexes, and other subjects. The project was scheduled to be in operation at the end of 1982. CMET also offers the Digital Private Document Exchange system (Zenith Data Systems), a sophisticated program for commercial use that will be operational in 1983. CMET designs and assembles original equipment manufacture microcomputers and software as well.

Corporacion RABCO (engineering and consultancy in telecommunications and computer science), DATEX Ltda. (development and investigation in telecommunications), and SEL (division of special services) function as CMET subsidiaries. In addition, CMET has a branch office in Vina del Mar to carry out telephone service. The entire CMET holding currently employs 115 workers and several specialized engineers.

CIDCOM, another telephone firm, will start functioning in 1983. Initially, the CIDCOM network will reach only 50 square kilometers and will operate from a station installed on San Cristobal, a Santiago hill. CIDCOM has 120 channels (microwave analog system), 24 channels for mobile telephones, and 1,000 subscriber units. The company is a joint venture of two U.S. firms, Pacific Telcom and Alsacom, and the Chilean Consultora Interamericana de Desarrollo Ltda.

Telex, Telegraph, and International Services

Telex-Chile was established in 1895 under the name of Correos y Telegrafos de Chile, a government-owned enterprise. Its monopoly on telegraphic services throughout the country is due to undergo some change with its expected spinoff to the private sector in the near future.

Telex-Chile has purchased some equipment from U. S. firms, namely Databit and North Supply. Further acquisitions have been postponed, however, because of the recession and the possible sale of the firm.

Chile has in operation around 3,000 teleprinters, 30 switching systems, and 30 frequency-division multiplex and time-division multiplex telegraphic terminals. Pulse-code modulation is not yet in use in the country. Telex-Chile leases point-to-point teleprinter service to private users and recently has added some manual switching equipment in remote areas.

Transradio Chilena (VTR) Compania de Telecomunicaciones S.A., originally established in 1928 to operate international cables, became a corporation under its present name in 1965. Transradio Chilena has been authorized to operate from and to locations in the south of Chile.

Transradio Chilena is owned mainly by Thomson-CSF (France; 24.8 percent); West Coast Cable of America Telegraph Co. (United Kingdom; 24.5 percent); Allgemeine Elektricitaets Geselschaft, AEG, and Telefunken (Germany; 12.8 percent); RCA Global Communications (United States; 24.5 percent); and Siemens AG Investment Overseas (Canada; 13.3 percent). The company recently purchased two telephone operations in the south of Chile, Compania de Telefonos de Valdivia and Compania de Telefonos de Coyhaique, the first telephone firms sold by CORFO, for $7.8 million. Transradio Chilena is believed to have invested about $6.5 million in telecommunications equipment (switches) in the past few years. Additional switching equipment reportedly will be acquired for the recently purchased telephone companies, mostly for the Valdivia concern.

ITT Comunicaciones Mundiales S.A., established in 1928, is authorized to operate international telecommunications services, including telephone, telegraph, and transmission of voice and data, facsimile, and all other telecommunications except television. The company uses satellite channels rented from ENTEL-Chile. ITT Comunicaciones Mundiales, a subsidiary of ITT World Communications (United States), employs 153 persons in Chile.

Texcom Ltda. was established in 1981 and operates international telex through channels rented from ENTEL-Chile. Although Texcom is not now considering the purchase of teleprinters, switching equipment, accessories, or other telex items, when the recession is over this firm will seek to acquire modern telex communications equipment.

Texcom, a correspondent of Western Union

(United States), has recently formed Execom Ltda., a telephone company with permission to start operations in April 1983. Execom's authorization extends to 5,000 digital telephone lines in Rancagua and another 5,000 for Antofagasta in the north of Chile. The company will be requesting bids for this project, consisting of two digital switching systems and accessories worth about $3 million.

Local Manufacture

Most production or assembly of telecommunications goods such as simple transistors and af and vhf communications equipment has ceased. At present, only a few standard antennas and crossbar switches on special request from CTC; public address systems, loop extenders, loop magnet converters, and some wire and cable for communications purposes are also manufactured in Chile.

Compania Standard Electric S.A.C., a subsidiary of ITT (United States), was established in 1942. The firm assembles telephone equipment, such as public and private PBX's, with both domestic and imported parts, and installs and services it as well.

During 1981, Standard Electric reduced its telecommunications equipment manufacture to crossbar switches and sharply cut its personnel. The company now imports finished products for the domestic market.

Standard Electric performs a major installation function for CTC. Its 1981 workload included 8,000 lines and their corresponding trunks; 1,200 automatic lines in Antofagasta; a large network in Valparaiso consisting of 2,500 automatic lines and corresponding XB trunks; the DDD system in selected cities, and the centralized observation center, including one main PBX, and remote units in each of CTC's branches in the Santiago area.

Manufacturas de Cobre S.A. (MADECO) produces lead- and plastic-sheathed pair cables (plastic and paper insulated), drop wire, and related items.

Video and Radio Broadcast Equipment

Closed circuit television.—The market in Chile for closed circuit television (CCTV) is small at present, due mainly to the high cost of the equipment—about $1,200 for a complete CCTV system for a typical supermarket. CCTV is used mainly in industrial process supervision, banks, and similar applications. Japanese-made CCTV equipment now marketed in Chile comes from NEC, Nippon Electric, JVC, Japan Victor, National Panasonic, and Sony.

Radio broadcasting equipment.—The sizable Chilean radio transmission market is supplied by major U.S. manufacturers; such as Bose, and several Japanese firms, including National Panasonic, and Sony. Radio broadcasting operators try to renew and modernize their equipment to remain competitive in the Chilean radio market but purchases of systems and accessories have decreased lately due to the recession. Authorized radio operators range from 143 AM and 119 FM stations throughout the country (including Easter Island) to more than 400 private radio communications services, about 3,000 radio amateurs, a maritime mobile service, and an aeronautical mobile service.

Television broadcast transmission.—Chilean TV transmission covers 95 percent of the country, but only about 75 percent of the population enjoys good access. A national TV council (Consejo Nacional de Television) supervises the orientation, programing, and development of television services, which can be offered only by universities and government entities. All television channels must be self-supporting. Color television was introduced in the country in 1978. The NTSC system used is the same as in the United States.

Five television channels transmit to 1.8 million TV sets, more than half of them color sets. Television Nacional de Chile, Channel 7, with 107 stations covers more than 95 percent of Chile's territory and it is the most important television outlet owned by the Chilean Government. Channel 7 relays directly from its studios in Santiago to places as far as Punta Arenas and Easter Island. U.S. and Japanese manufacturers supply this television station with equipment, as do Pye (United Kingdom) and Thomson (France).

Corporacion de Television Universidad Catolica de Chile, Channel 13, operates in Santiago, Valparaiso, San Fernando, and Concepcion. Channels 13 and 7 are interested in installing earth stations for satellite transmission when the recession is over. Channel 13 uses some U.S.-made apparatus for vhf transmission but also has Japanese equipment. Major purchases from U. S. firms are often arranged through personal onsite visits by the chief engineer.

Corporacion de Television, Universidad de Chile, Channel 11, operates only in Santiago.

This organization has just purchased Harris (United States) instruments.

Universidad Catolica de Valparaiso, Channel 5 in Santiago and Channel 4 in Valparaiso, is the oldest TV station in Chile, operating only in these two cities. Channel 5's recent acquisition of U.S.-produced systems has resulted in improved transmission.

Universidad del Norte operates "Red de Radio Television Telenorte" with Channel 3 in Antofagasta, Channel 8 in Calama and Chuquicamata, Channel 12 in Iquique with repeating station to Pozo Almonte Channel 4, Channel 11 in Arica, and Channel 13 Pedro de Valdivia and Maria Elena.

No cable television currently exists in Chile, although the new law permits this type of TV transmission and several applications are pending. One of them has already been approved: El Mercurio, owner of the most important Chilean chain of newspapers, some time ago acquired the necessary equipment for operating its cable TV. Considerable interest exists in the details and prices of equipment and in the technical know-how required to provide cable television.

Satellite transmission equipment.—At present only ENTEL-Chile is connected to INTELSAT satellite transmission and telephones (long-distance), radios, and television stations operate on rented ENTEL-Chile transmission equipment. Many firms are considering establishing earth stations for direct connection with the INTELSAT satellite, bypassing ENTEL-Chile.

Equipment with Highest Sales Potential

Market researchers state that specialized telecommunications equipment and systems are always welcome by prospective end-users. Best sales prospects include:

- Electronic switching PBX
- Digital and analog switching systems
- Small exchanges (100 to 1,000 and up to 5,000 lines)
- Electronic PABX and accessories with the "free-hands" system incorporated
- Digital and electronic exchanges for rural areas (20-100 lines) equipped with microwave for long-distance communication
- Microwave systems in general (digital and analog)
- Telephone apparatus of the "smart" type
- Sophisticated intercoms (at present imported from Japan and Germany)
- Vhf mobile telephones (vehicular for taxis, fire fighting squads, and ambulances) and radios
- Paging systems (only tone permitted) of the multidirectional type
- Secretarial systems
- Answering devices
- Coin-operated phones
- Cables and wire of various types
- Marine mobile radios
- Lightwave (fiber optics), all types
- Frequency-division multiplex, time-division multiplex, and pulse-code modulation multiplexers
- Data communications equipment, especially modem eliminators
- Data modems from 300 bps up to 19,200 bps (terminals only)
- Satellite channel connections (for new telephone companies, radios and TV stations transponders to INTELSAT)
- VTR cameras, monitors, receivers, and control consoles
- Medium wave multichannel 360 megacycles
- Hf transmitters (if competitive in prices with Japan, Taiwan) for use by radio amateurs, radio taxis, ambulances
- Amplifiers, consoles, recording equipment (playback decks, reel-to-reel and cartridge), microphones, speakers, buried cables
- Antenna couplings
- SCA generators
- Vhf transmitters for TV stations
- Antennas and transmission lines
- Cameras and pedestals
- Standard signal generators
- Transmission characteristics testers
- Equalization and coil loading equipment
- Oscilloscopes

Training and Services

Training in the telecommunications field is performed by public and private technological schools, industry, government telecommunications entities, armed forces schools, and universities. Engineers require 6 years of university study, while technicians in electricity and electronics are certified after a 4-year program. Chilean universities reportedly offer highly qualified staff and faculty and enough well-trained graduates to meet the needs of the country's telecommunications industry.

Good technical maintenance services are available locally from representatives and agents in the telecommunications field, as is consulting-firm work in systems design, network planning, and support services for data communications and other aspects of telecommunications.

Marketing Practices

U.S. producers of telecommunications equipment, systems, and accessories should have import agents or distributors in Chile to penetrate this market. Some major end-users, especially government-owned entities, place orders directly with the manufacturer, sometimes requesting credit or negotiating financial arrangements through a lending institution. As of March 1983, the Government requires that all imports be financed from abroad for at least 120 days. The present uncertainty of dollar/interest rates has restricted small-scale credit, which is obtained from local banks.

Chilean firms generally call for bids on large purchases. The advantages provided by an appointed agent or distributor include presenting bids on time, obtaining first-hand information, and exercising good followup. Agents must be equipped with complete technical information and price lists on the goods they are representing, as well as with samples of equipment when feasible.

Tariff Rates

With a small number of exceptions, Chile has a uniform 20-percent ad valorem tariff on the c.i.f. value of telecommunications equipment. TV color sets are subject to a 30-percent ad valorem duty. A 20-percent value added tax is also charged on all imports. Products used in two regions, Iquique (north) and Punta Arenas (south), enjoy duty-free treatment and become subject to tariffs only if they are shipped to other parts of the country. Many agents for foreign firms find it convenient to operate branch offices in these duty-free zones.

Chile: Basic Economic Indicators

Population:	11.3 million (1982)
Area:	756,626 sq. km.
Administrative units:	12 regions, 1 metropolitan district, 41 provincial subdivisions
GNP:	$23.2 billion (1982)
Contributions to GDP:	Services 56% (1980) Industry 37% Agriculture 7%
Per capita income:	$2,150 (1980)
Inflation rate:	31.2% (1980)
Exports f.o.b.:	$3,800 million (1982)
U.S. share	21.3% (1982)
Imports f.o.b.:	$3,600 million (1982)
U.S. share	25.7% (1982)

Major trading partners:	United States, Germany, Japan, Brazil, United Kingdom, Venezuela
Exchange rate:	46 pesos=US$1 (1982)
Fiscal year:	Calendar year
Current account balance:	–$1,200 million (1982)
International reserves:	$2,577.5 million (1982)
Federal budget	
revenues:	$7.3 billion (1980)
expenditures:	$6.9 billion (1980)
Labor force:	2,973.5 thousand (1982)
Unemployment:	23.7% (1982)

Useful Addresses

Embassies

American Embassy
Commercial Section
Codina Building
1343 Agustinas
Santiago
tf: 710133
tx: 40062-ica-cl

Embassy of Chile
1732 Massachusetts Avenue, N.W.
Washington, DC 20036
tf: 785-1746

Telecommunications administration

Ministerio de Transportes y Telecomunicaciones
Subsecretario de Teleconunicaciones
Administracion Chilena de Telefonos
Amunategui 139
Casilla 120
Correo 21
Santiago
Attn: Subsecretario de Telecomunicaciones
tf: 69131
tg: subsectel santiagodechile
tx: 40200 sstel cl

PTT (telephone)

Compania de Telefonos de Chile
San Martin 50
Casilla 160
Santiago
Attn: General Manager
tf: 86616
tg: telefonos santiagodechile
tx: 40955 ctch cl

PTT (telegraph/telex)

Telex-Chile
Morandes 147
Santiago
tf: 60477
tx: 40550

Leased lines and data communications

Empresa Nacional de Telecomunicaciones (ENTEL-Chile)
Santa Lucia 360
Casilla 4254
Santiago
tf: 712121
tg: entel chile santiagodechile
tx: 40683

Radio broadcasting

Asociacion de Radio Difusoras de Chile
Casilla 10476
Santiago
Attn: Presidente
tf: 34509
tg: archi

Television broadcasting

Television Nacional de Chile
Bellavista 990
Casilla 16104
Correo 9
Santiago
Attn: Director General
tf: 774552
tg: tv chile
tx: 440181 tvc cz

Technical standards

Direccion de Asuntos Economicos Multilaterales
Ministerio de Relaciones Exteriores
Bandera 52 3er Piso
Santiago
tf: 71 11 42
tx: 94642 chile ku

Additional Information

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CMS

Country Market Survey

Food Processing and Packaging Equipment

Norway

DEPOSITORY
JUL 29 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
nternational Trade Administration

As Norwegian food processors respond to changes in their society and their industry, the market for food processing and packaging equipment is expected to grow at an average annual rate of 4.2 percent, from $148.2 million[1] in 1980 to over $182 million in 1985 (see table 1). Higher real incomes, which place a premium on leisure time, and more women working outside the home translate into rising demand for prepared foods and foods portioned and packaged for supermarket sales. High labor costs have predisposed the food and beverage industry towards automation, and growing familiarity with advanced equipment will spur demand for modern processing and packaging machinery. By offering machinery with special features unavailable from other manufacturers, and by providing Norwegian customers with responsive, effective service, U.S. suppliers can expect sales hikes of about 7 percent a year, to almost $11 million in 1985 (see table 2).

Table 1.—Norway: The market[1] for food processing and packaging equipment, 1979, 1980, and projected 1985 (in millions of U.S. dollars)

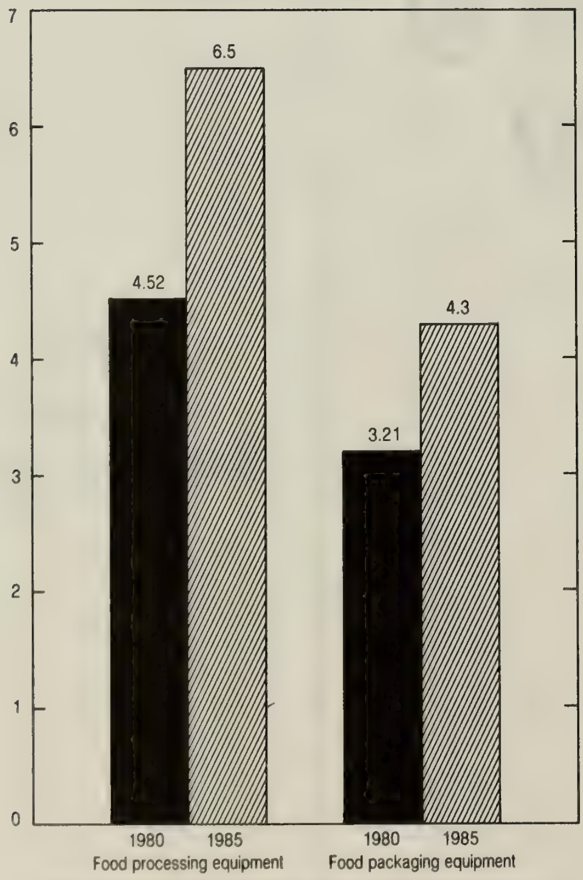
	1979	1980	1985
Food processing equipment			
Production	69.30	76.23	89.2
Imports	68.51	75.37	92.7
Exports	41.58	45.74	53.5
Market size	96.23	105.86	128.4
Food packaging equipment			
Production	29.70	32.67	38.2
Imports	26.56	29.22	38.6
Exports	17.82	19.60	23.0
Market size	38.44	42.29	53.8
Total food processing and packaging equipment			
Production	99.00	108.90	127.4
Imports	95.07	104.59	131.3
Exports	59.40	65.34	76.5
Market size	134.67	148.15	182.2

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Parts are excluded.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Food Processing and Packaging Equipment in Norway" (see Additional Information box). Figures in this report are based on data gathered in Norway, including available government statistics, industry reports, and trade source estimates and projections.

Norway: U.S. sales of food processing and packaging equipment, 1980 and projected 1985

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research report; values based on Norwegian trade source estimates.

Sales of **food processing equipment** in Norway stood at $105.9 million in 1980. In sectors where demand for traditional food items is stagnating, processors are developing new products, which will mean investment in new machinery. In addition, government regulations make it difficult to lay off workers once they've been hired, so employers in the food industry try to use equipment rather than labor to expand production. Processors expect to increase their purchases by 3.9 percent annually, reaching $128 million in 1985.

A rapid increase in the number of supermarkets in the late 1970's and today's trend toward energy and raw material conservation will strongly influence tomorrow's **food packaging equipment** market. As demand grows for lighter, more innovative packaging and designs that extend shelf life, sales are forecast to rise 5 percent annually, from $42.3 million in 1980 to almost $54 million in 1985. Equipment that rationalizes product handling and cuts cost through multipackaging also helps bolster sales.

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[1] All values are shown in U.S. dollars; local currency data are converted at the following exchange rate: U.S.$1 = 5.07 NKr. Values are expressed in 1980 constant dollars/prices.

Table 2.—Norway: Imports of food processing and packaging equipment by country of origin, 1979, 1980, and projected 1985

	1979		1980		1985	
	Value ($ millions)	Share (%)	Value ($ millions)	Share (%)	Value ($ millions)	Share (%)
Food processing equipment						
United States	4.11	6	4.52	6	6.5	7
Scandinavia	23.98	35	24.87	33	27.8	30
Germany	16.44	24	20.35	27	24.1	26
Netherlands	7.54	11	8.29	11	9.3	10
Other countries	16.44	24	17.34	23	25.0	27
Total	68.51	100	75.37	100	92.7	100
Food packaging equipment						
United States	2.66	10	3.21	11	4.3	11
Germany	10.62	40	11.98	41	15.4	40
Scandinavia	4.25	16	4.97	17	7.3	19
Italy	1.33	5	2.05	7	2.3	6
Other countries	7.70	29	7.01	24	9.3	24
Total	26.56	100	29.22	100	38.6	100
Total imports from U.S. ...	6.77		7.73		10.8	

Source: See source notation of table 1.

Competitive Environment

Norway's food processors import most of the equipment they need, about 70 percent in 1980. The country's own manufacturers, many of whom specialize in machinery for processing and packaging fish and seafood, are strongly export-oriented. In 1980, exports accounted for 60 percent of Norwegian production. Trade sources expect this ratio to remain about the same through 1985. This leaves a clear field for imports, which amounted to $104.6 million in 1980. Other than a tariff of 8 percent on most food processing and packaging equipment coming from outside the Common Market and the European Free Trade Association (EFTA), domestic manufacturers have no advantage over their foreign rivals. There are no "buy national" policies imposed by the Norwegian Government. As the local competition struggles with stagnating productivity and sharp cost hikes in the wake of the Government's lifting of a 1978-79 wage/price freeze, imports are projected to expand to about 72 percent of the market in 1985. Foreign suppliers can expect to boost their sales about 4.7 percent annually, to over $131 million in 1985.

American vendors shipped $7.7 million worth of food processing and packaging equipment to Norway in 1980. U.S.-built equipment, such as highly specialized single-purpose processing machinery and continuous process systems, will have an advantage as small, inefficient plants are replaced by large establishments that can achieve economies of scale. As food processors become more familiar with American products, industry observers expect stepped up purchases of U.S.-built machinery. By 1985, their share is forecast to rise a percentage point, constituting 8.2 percent of imports. Most U.S. firms market to Norway from Sweden and Denmark and could improve their export sales even further by using sales agents in Norway.

European food processing and packaging equipment manufacturers, stressing customer service and suitability to local conditions, have a strong reputation in Norway. Germany, with 31 percent of Norway's equipment imports, is by far the single largest foreign supplier. German sales in 1980 amounted to $32.3 million. Competitors in Sweden and Denmark, which provide over 28 percent of imports, regard Norway as an extension of their home markets and give customers especially careful service, such as making product changes to meet specific customer needs. Norwegian buyers stress the importance of prompt deliveries, low shipping charges, and good after-sales service, which German and Scandinavian companies are said to provide. In addition, these major suppliers cater to the Norwegian preference for medium-sized machinery and offer moderately priced and flexible lines of equipment.

But purchase decisions do not depend solely on price. Dutch vendors are becoming more competitive, even though their equipment is generally as expensive as U.S.-made items. Norwegian purchasers appreciate the Dutch reputation for well-established sales organizations and excellent service. Their equipment is cited for its reliability and its ability to handle small production runs. Many of the Dutch exports, however, come from the Dutch subsidiary of Alfa-Laval (Sweden).

Food processing equipment.—Imports of food processing machinery are forecast to grow about 4 percent annually from $75.4 million in 1980 to $93 million in 1985, keeping the ratio of imports to the overall market steady at the current high rate of around 70 percent. American vendors can expect to increase their 6 percent share of imports, with shipments jumping 7.5 percent annually to $6.5 million in 1985.

Process and quality control equipment represents the greatest growth potential for future sales from the United States. Other items with good sales prospects (see Best Sales Opportunities for U.S. Exporters list) are machinery for meat portioning and deboning, poultry processing, soft drink manufacturing, and quick freezing and refrigeration. Furthermore, since Norwegian labor unions are stressing improved working conditions, machinery that reduces noise and eliminates manual lifting of 15 kilograms (kg) or more could be important.

U.S. builders of processing machinery enjoy good opportunities in the meat processing sector, where managers are looking for machines capable of cutting and portioning without damaging meat quality. Advanced sawing, poultry eviscerating, and bone chopping machines are already in use. Meat processors also express interest in finding new techniques to defrost frozen meat quickly and to process meat byproducts for industrial use. The sector's conversion to larger plants should further stimulate U.S. sales. Well-known American firms active in the market include: Stephen Paoli (large boning machines), Townsend Engineering (derinding apparatus and compactors), and Urschel Laboratories (meat comminuting machinery).

American suppliers can also expect to do well with machinery for processing miscellaneous food products, including snack foods. Good opportunities are predicted for sales of snack food extruders and potato chip sizer-halvers/slicers/fryers. In the beverage sector, U.S. vendors dominate the market for soft drink carbonation machinery. While American sales to Norwegian bakers are expected to remain limited by the small size and conventional equipment needs of most establishments, U.S. suppliers have almost 20 percent of the growing market for rotating and continuous transport bakery ovens.

German vendors, the largest third-country suppliers, are forecast to maintain their share of imports (slightly over one-fourth) with sales of food processing equipment valued at $20 million in 1980. Firms such as Cepa, Vemag, Kramer Grebe, Sedelmann, Treif, Vosswerke, and Maurer Sohne are leading suppliers of meat cutting, stuffing, and curing machines and centrifuges. Lubeca and Baader dominate imports of fish and seafood processing equipment.

Similarities between Norwegian and German tastes in bakery and confectionery products give German equipment manufacturers an edge in these sectors. The firms of Werner Pfleiderer and Winkler supply most of the automatic plant and roll-dough dividing machines needed to manufacture biscuits, gingerbread, wafers, and crackers. In confectionery products, the German firms of Hermann Bauermeister, Winkler, Braunschweigische, and Makat dominate imports of chocolate-making machines, confectionery lines, and tableting machines.

Scandinavian firms also profit from their proximity to Norway and similar lifestyles. They provide a third of the imports of food processing equipment, with projected sales of almost $25 million in 1980. From Denmark, Cabinplant and Kronborg are important suppliers of fish and seafood processing machinery. For the meat processing sector, Denmark's Wolfking supplies conveyors and meat mixers, Lyngaard provides curing equipment, Atlas installs slaughterhouses and blood utilizing plants, and Selo-Gjerstrup sells meat bone separators. Cabinplant and Jorgensens are large suppliers of fruit and vegetable processing equipment. Danish manufacturers have long served Denmark's own famous dairy industry and easily transfer their expertise to the Norwegian market. Perfora supplies complete cheese-making lines, and Paash Silkeborg markets milk filters, coolers, testers, sterilizers, and machinery for evaporated milk and cheese manufacturing. Danish manufacturers of bakery equipment such as Diaf, Jorgensen, Moller, and Wodschow are important suppliers of kneading and mixing machines. Moenia sells biscuit-making, dough dividing, and rusk cutting machines, while Vesta offers combined baking ovens and high-speed kneaders. Other prominent Scandinavian food processing and packaging equipment manufacturers who sell in Norway are Sweden's Alfa-Laval (broad range of machinery), Arenco (fish processing equipment), and Elektro Dahlen (ovens). Finnish competitors include Hydrovoima (automatic bread lines) and Ruostumattomat Teraslaitteet (mixers and frying machines).

Factories in the Netherlands supply about 11 percent of Norway's food processing equipment imports, and are expected to maintain this share with projected 1985 sales of $9.3 million. Dutch firms are important sources of dairy and meat processing equipment. Alfa-Laval's Dutch plant exports pasteurizers, homogenizers, sterilizers, and cheese production machinery. Dutch-owned firms such as Stork and Hoeksma also sell substantial quantities of dairy machinery to Norway. Berkel and Finis supply meat cutting, portioning, and mixing machinery; Nord Nederlandse Machinefabriek and Nijhuis provides hog and calf kill lines. Finis, Goudsche, Komen Kuin, and Stork are leading Dutch companies selling processing equipment to the Norwegian fruit and vegetable sector.

European subsidiaries and licensees of U.S. firms, primarily in Germany and Britain, are important to the success of European countries on the Norwegian market. These subsidiaries have the dual advantage of American technology and European proximity to customers, as well as lower transport costs and low tariffs. From Germany, FMC Wiesbaden, W.R. Grace, and Hayssen Europa all export a wide range of equipment to Norway. Leading U.K. subsidiaries of U.S. firms competing on the Norwegian market include AMF Ltd. (bakery equipment), Barry-Wehmiller (beverage and food processing devices), and Townsend (meat-processing equipment).

Norway's domestic production of food processing machinery amounted to $76.2million in 1980, of which $45.7million was exported. Both production and exports are projected to rise about 3 percent annually. Government has no comprehensive development plans specifically addressing the food processing equipment industry. However, joint projects between Government-run research institutes and equipment manufacturers have helped the domestic industry develop advanced new machines.

About 25 firms, all domestically owned, manufacture food-processing and packaging equipment in Norway. Most companies cater to the historically important fish and seafood sector. Industry sources note that local suppliers are unsurpassed in providing technologically advanced equipment to the small fish processors that predominate in Norway. Leading manufacturers include Myrens, Trio, Broderna Hetland, Kvaerner Kulde, Noblikk Sanem, Heinsa, and Sivert Eindes. Important suppliers to other sectors are Landteknikk, which sells equipment to the dairy industry; Stord Bartz, providing dehydrating plants for fish and bone meal and industrial plants for making animal fodder from food processing byproducts; Elektromekanikk, which manufactures automatic controls for dairy and brewery storage tanks; and Fodema, a leading supplier of automatic contact frying machines.

Food packaging equipment.—Imports of food packaging equipment are projected to grow briskly, from $29.2 million in 1980 to $39 million in 1985. Trade sources expect American sales of packaging equipment to expand a healthy 6 percent annually to $4.3 million in 1985. American expertise in computer and electronic-based systems will be an advantage for U.S. suppliers as more systems become integrated and centralized. Weight control and marking systems integrated with inventory control have high sales potential. In addition, machines that combine packaging with transport and distribution functions should be a growth area as Norwegian processors struggle with high wage rates. With the growth of large-scale retailing in Norway, cartoning equipment and wrapping machines adaptable to ready-for-sale modules are also considered highly salable.

American packaging equipment vendors have good opportunities to expand sales to the miscellaneous food products sector, which is the most "Americanized" in the Norwegian food industry in product types and marketing techniques. Sellers of miscellaneous food products, mostly snack foods, are constantly introducing new items and redesigning existing product packages for better marketing. Packaging operations in this sector are already highly automated. Vacuum packing is increasingly popular.

In general, Norwegian processors favor European-made bottle fillers, can closers, and vacuum form/fill/seal systems, which they believe are superior in design and more suitable for the small production runs common in Norwegian industry. European manufacturers also supply a significant share of imports of high-speed cartoning and shrink-wrap machinery because of their flexible equipment designs, product support, and successful early entry into the field.

With 41 percent of imports in 1980, German vendors are the leading foreign source of packaging machinery in Norway. The German share of packaging imports is forecast to stay at about 40 percent over the next few years, with sales growing 5 percent annually to over $15 million in 1985. Largely because of its reputation for engineering sophistication and reliability, Norwegian food processors often choose German machinery for complex packaging tasks and those requiring high-speed operation. Leading German vendors of bread and bakery goods packaging equipment are Werner Pfleiderer, Hassia, Spang Brand, and Optima. Kramer Grebe does well with meat packaging machinery, Enzinger Union and H. Srunck sell bottling systems, Hensella and Robert Bosch offer confectionery and chocolate packaging machinery, and Hesser succeeds with equipment for packaging flour and other powdered foods.

Firms from Norway's Scandinavian neighbors captured 17 percent of imports in 1980. Their collective sales are foreseen climbing about 8 percent annually, to some $7 million in 1985, representing about 19 percent of imports. Cabinplant of Denmark is a major supplier, offering standard machines and complete lines for fish, fruit, vegetable, and meat packing. Swedish firms active on the market include TetraPak (machinery for packaging fluids) and Gelo Maskiner (shrink packaging machines). A portion of Scandinavian equipment shipments to Norway is believed to be re-exports, since some U.S. and third-country firms serve all of Scandinavia from a single Danish or Swedish distribution point. Denmark's Selo Gjerstrup, for example, represents leading firms such as Baader (Germany) and Hollymatic (U.S. and Switzerland) for standard equipment.

Italian manufacturers are carving out a small but stable share of imports with simple and economical packaging machines. According to industry observers, Italian companies can expect their sales to grow by 2 percent annually, to a 1985 level of $2.3million. Leading Italian suppliers are Fornarolli, which exports fillers for liquids and viscous products such as yogurt and ice cream; SMAIL, which provides automatic packaging equipment for bakery products; Sirtha, for shrink wrapping systems; and Donazzi, for capping, lidding, and packaging machinery. FMC's Italian subsidiary and OTEM are prominent suppliers of packaging machinery for ice cream, frozen foods, chocolate and confectionery, and bakery products.

A reputation for quality and accuracy gives Swiss manufacturers an important advantage in sales of high performance packaging equipment. SIG (Schweizerische Industrie-Gesellschaft) is the dominant vendor of wrapping devices and packaging equipment, especially for the bakery products sector. Other leading Swiss suppliers are Hoegger Cie. for meat packing machinery, Reichlin for pouch machines, and Multivac for blister packaging machines.

Domestic output of food packaging equipment amounted to $32.7 million in 1980. Forecasts show production rising a modest 3 percent annually to $38 million in 1985. Exports are projected to claim over half this total ($23 million), up from $19.6 million in 1980.

Well-known Norwegian manufacturers of food packaging equipment include Landteknikk, a leading supplier of packaging machinery to the dairy industry; Trio Maskinindustri, which manufactures packaging equipment for the fish processing industry; and Holmek, which produces wrapping machines and automatic pallet loaders for sacks and cardboard boxes. In addition, Ankjaer Maskiner supplies filling machines for peas, carrots, and ice cream; Maskinteknikk makes dough packing machines; and Arplast Infrapak manufactures stretch film packing machines. Most of these suppliers are very small companies. With the exception of Landteknikk (460 employees, $50 million turnover) and Trio Maskinindustri (110 employees, $18 million turnover), domestic suppliers employ fewer than 30 people each.

The Food Processing Industry

Judged by its 2,600 production units and nearly 57,000 workers (see table 3), food processing is one of the most important industries in Norway, a nation of slightly over 4 million people. Small family-run businesses are still the rule in most sectors: almost 2,400 establishments employ fewer than 50 people and only 27 firms have more than

Table 3.—Norway: Total employment and number of establishments, by size,[1] in food processing industry sectors, 1979

Sector	Total employment	Number of establishments Total	Large	Medium	Small
Meat, poultry, and eggs	10,521	320	6	50	264
Dairy products	6,511	215	2	27	186
Preserved fruits, vegetables, and specialty products	1,577	41	1	9	31
Grain mill products	2,439	270	-	9	261
Bakery products	7,506	824	2	13	809
Sugar and confectionery products	2,856	12	3	3	6
Fats and oils	3,358	84	2	16	66
Beverages	5,111	69	8	15	46
Fish and seafood	14,062	672	2	65	605
Miscellaneous food products	2,700	113	1	13	99

[1] Size of establishments is based on number of employees, as follows: large, 200 or more; medium, 50 to 200; and small, fewer than 50.

Source: See source notation of table 1.

200 workers. Small bakeries averaging fewer than 8 workers account for over 30 percent of all food processing establishments. One-fourth of the industry's employees work in the important fish and seafood processing sector; meat, poultry, and eggs processing accounts for an additional 19 percent of employment.

Sales of processed foods in 1979 amounted to over $5 billion (see table 4), with the meat, poultry, and egg sector accounting for 24 percent of the total. Norwegians consumed most of the industry's output themselves; only 6.6 percent of the industry's revenues came from export sales. The fish and seafood and fats and oils sectors generated 85 percent of export income. About 23 percent of the processed fish and seafood and 20 percent of fats and oils production went to foreign markets.

Norwegians, like other Europeans, are changing their patterns of eating and food shopping. Women now account for 39 percent of Norway's labor force, and the percentage (already one of the highest in Western Europe) is still rising. This provides additional income for luxury and prepared foods and increases demand for time-saving foods and convenient shopping. In retailing, the changeover from small family-owned food stores to supermarkets offering one-stop shopping is particularly striking. Supermarkets, in turn, increase the demand for standardized, prepackaged foods with a long shelf life.

Frozen foods will probably be a major growth area, since over 75 percent of all households now own freezers. Output of frozen vegetables (including potatoes) soared from 13,900 metric tons (MT) in 1973 to 22,000 MT in 1978, and a 1983 production volume of 26,000 MT is projected (see table 5). Similar growth is anticipated in production of frozen fruits and berries; from 300 MT in 1973 to 1,400 MT in 1978 and 2,000 MT in 1983. Like their American counterparts, Norwegian homemakers save time by shopping less often for a wider variety of foods that can be stored (often frozen) until needed. In 1978, Norwegians consumed almost 12kg of frozen food per person.

Institutional kitchens (hospitals, homes for the elderly, armed forces institutions, etc.), which accounted for 12 percent of total food purchases in 1978, are also beginning to buy more prepared foods. These large users have traditionally prepared their own meals, but with rising labor costs and the improved variety and quality of prepared foods, their consumption is likely to include more preprocessed, packaged products.

Diet foods offer another area of sales growth. In 1978 weightwatching Norwegians spent almost $38 per household on diet foods, more than anywhere else in Western Europe. Since Norway's Government has adopted an official nutrition and

Table 4.—Norway: Annual capital expenditures and sales by food processing industry sectors, 1979
(in millions of U.S. dollars)

Sector	Annual capital expenditures	Sales Total	To domestic market	To export market
Meat, poultry, and eggs	37	1,209	1,203	6
Dairy products	49	658	653	5
Preserved fruits, vegetables, and specialty products	10	116	114	2
Grain mill products	23	703	700	3
Bakery products	13	232	221	11
Sugar and confectionery products	5	175	166	9
Fats and oils	34	535	426	109
Beverages	19	395	391	4
Fish and seafood	43	770	594	176
Miscellaneous food products	15	322	311	11
Total	248	5,115	4,779	336

Source: See source notation of table 1.

Table 5.—Norway: Output of major processed food products, 1973, 1978, and projected 1983

Sector/product	Units	1973	1978	1983
Meat, poultry, and eggs				
Beef	thousand MT	81.0	83.0	86.0
Pork	thousand MT	84.0	89.0	93.0
Lamb	thousand MT	2.0	2.0	2.0
Sausages	thousand MT	58.0	61.0	63.0
Veal	thousand MT	5.0	6.0	6.0
Chicken	thousand MT	8.0	9.0	10.0
Turkey	thousand MT	1.0	1.0	1.0
Dairy products				
Butter	thousand MT	19.0	23.0	24.0
Fluid milk	thousand MT	874.5	1,800.0	1,950.0
Cream and sour cream	million liters	26.0	28.0	29.0
Cheese	thousand MT	38.0	50.0	53.0
Ice cream	thousand MT	26.0	33.0	37.0
Preserved fruits, vegetables, and specialty products				
Preserved vegetables	thousand MT	28.1	44.0	46.0
Frozen vegetables	thousand MT	13.9	22.0	26.0
Preserved fruits	thousand MT	2.2	2.2	2.4
Frozen fruits	thousand MT	.3	1.4	1.7
Jellies and marmalades	thousand MT	10.6	12.3	13.9
Soups	thousand MT	4.7	5.0	5.8
Juices and syrups	thousand MT	38.9	51.7	65.7
Grain mill products				
Wheat	thousand MT	210.0	255.0	261.0
Rye	thousand MT	57.0	51.0	45.0
Oat	thousand MT	10.0	11.3	11.7
Corn	thousand MT	1.6	1.6	1.6
Mixes	thousand MT	4.5	5.9	6.8
Bakery products				
Crisp bread	thousand MT	24.0	25.8	26.3
Soft bread	thousand MT	141.1	137.5	138.0
Buns and cakes	thousand MT	31.4	28.0	28.2
Cookies	thousand MT	13.9	11.0	11.0
Rusks and biscuits	thousand MT	10.1	12.1	12.3
Sugar and confectionery products				
Sugar confectionery	thousand MT	6.7	7.3	8.0
Chocolate confectionery	thousand MT	16.2	17.7	19.4
Fats and oils				
Margarine	thousand MT	60.3	62.0	63.0
Hydrogenated oils and fats	thousand MT	63.0	64.0	65.0
Other fats and oils	thousand MT	295.0	301.0	317.0
Beverages				
Beer	million liters	120.0	200.0	200.0
Carbonated drinks	million liters	202.0	170.0	170.0
Other beverages (including mineral water)	million liters	36.0	36.0	36.0
Fish and seafoods				
Fresh fish fillets	thousand MT	43.0	42.0	41.0
Frozen fish fillets	thousand MT	21.9	21.9	21.9
Salted, dried, and smoked fish	thousand MT	22.1	22.3	22.4
Miscellaneous food products				
Vinegar	million liters	1.9	1.9	2.3
Spices	thousand MT	.5	1.3	1.4
Mustard	thousand MT	2.5	2.7	3.2
Mayonnaise	thousand MT	2.6	2.7	3.2
Yeast and baking powders	thousand MT	6.8	5.0	5.9
Other miscellaneous foods	thousand MT	32.1	31.5	31.5

Source: source notation of table 1.

food policy aimed at promoting healthful dietary habits, this trend is expected to continue.

To meet the changing demand patterns, the food processing industry invested nearly $250 million in new plant and equipment in 1979. Food processing and packaging equipment accounted for well over half the Norwegian industry's capital budget. Four sectors— meat, poultry, and eggs; dairy products; fats and oils; and fish and seafood—bought two-thirds of all food processing and packaging equipment sold in 1980 (see table 6). Processors of dairy products accounted for 26 percent of processing equipment purchases and 23 percent of packaging equipment purchases in 1980. Biggest buyer of packaging equipment was the fish and seafood sector, with 29 percent of purchases. These two sectors alone are projected to spend over $22 million on new packaging machinery in 1985.

Norway's per capita spending on food and beverage packaging is among the highest in Europe. Companies lavish attention on the design and graphics of food packages. Since television commercials and billboard advertising are nonexistent, the container itself is an important sales tool. Moreover, the trend toward high-volume distribution and retailing places greater demands on packaging to protect the product and extend shelf life. Vendors can expect a trend toward lighter packages for everything, more use of glass for premium foods, more blister packaging, more aseptic filling of liquids, and increased use of vacuum packing for dry foods (see table 7).

Table 6.—Norway: Sales[1] of food processing and packaging equipment, by end-user sector, 1980and projected 1985
(in millions of U.S. dollars)

	Food processing equipment		Food packaging equipment	
Sector	1980	1985	1980	1985
Meat, poultry, and eggs	14.82	20.0	4.65	6.9
Dairy products	27.52	32.4	9.77	12.0
Preserved fruits, vegetables, and specialty products	6.03	7.8	2.20	3.1
Grain mill products	6.46	7.2	1.69	2.0
Bakery products	4.77	6.4	1.40	2.1
Sugar and confectionery products	2.96	3.2	.93	1.2
Fats and oils	15.99	18.7	4.10	4.8
Beverages	8.15	9.5	2.83	3.7
Fish and seafood	10.06	12.5	12.35	15.2
Miscellaneous food products	9.10	10.7	2.37	2.8
Total	105.86	128.4	42.29	53.8

[1] Values exclude duties, taxes, and distribution costs.

Source: See source notation of table 1.

Table 7.—Norway: Sales[1] of food packaging equipment by type of equipment, 1980 and projected 1985
(in thousands of U.S. dollars)

Type of equipment	1980	1985
Container forming equipment		
Thermoformers	1.9	2.3
Blow molders	0.7	0.9
Can-making machinery	0.8	1.0
Subtotal	3.4	4.2
Container filling equipment		
Fillers for liquids	2.7	3.6
Fillers for viscous products	0.5	0.6
Fillers for dry products	1.1	1.1
Fillers for solids	0.3	0.5
Subtotal	4.6	5.8
Container/package/case closing and/or sealing equipment		
Heat sealers	0.5	0.9
Can closers, sealers	1.7	1.8
Cappers, crimpers, hooders	1.2	1.5
Corking equipment	0.7	0.6
Gluing equipment	0.6	0.9
Tying, sewing, stapling equipment	0.4	0.5
Cutting, slitting, trimming equipment	0.4	0.5
Subtotal	5.5	6.7
Container form/fill/seal systems		
Vacuum and gas systems	4.9	4.9
Aerosol systems	0.3	0.1
Subtotal	5.2	5.0
Product wrapping equipment		
Wrappers (direct, outer, overwrap)	1.8	2.0
Bundlers	1.2	1.7
Shrink wrappers and tunnels	2.3	3.1
Subtotal	5.3	6.8
Other wrapping equipment		
Pallet wrappers	1.2	1.1
Other	1.4	2.2
Subtotal	2.6	3.3
Packing equipment		
Cartoners	0.8	1.0
Multipackers	1.7	2.7
Subtotal	2.5	3.7
Marking equipment		
Labelers	0.4	0.5
Can wrappers	0.4	0.5
Coding equipment	0.4	0.8
Imprinting, printing equipment	0.6	0.9
Subtotal	1.8	2.7
Inspecting equipment	1.0	1.7
Container/product/package preparation and handling equipment	4.8	5.1
Other packaging equipment	5.6	8.8
Total	42.3	53.8

[1] Values exclude duties, taxes, and distribution costs.

Source: See source notation of table 1.

Several newer packaging technologies are taking hold on the Norwegian market. Food company executives have expressed interest in retortable pouches, but large-scale adoption by the Norwegian food industry is hampered by the technique's slow line speeds and the vulnerability of the flexible pouches to puncturing. Similarly, stretch film wrapping has started to compete with shrink film methods, though local buyers maintain that the technique needs further development to make it suitable for their smaller packaging applications.

Corrugated cardboard packaging has enjoyed a renaissance in Norway in recent years. Not only do food packagers have access to an ample domestic supply of the material, but new designs and improved quality have also made cardboard cost-competitive. In markets with a uniform product (e.g., milk, flour), energy-saving cardboard and paper packages are winning rapid acceptance. Norway's food industry used 142,000 MT of corrugated cardboard cartons in 1978, primarily in the meat, bakery, and preserved fruits and vegetables industries (see table 8).

Meat, poultry, and egg processing.—The 320 establishments (only 6 large ones) processing meat, poultry, and eggs employed some 10,500 workers in 1979 to generate total sales of $1.2 billion, almost a quarter of the overall sales of processed foods. The domestic market consumes over 99 percent of the sector's output. In 1978, Norwegians produced over 250 thousand MT of fresh meat, 35 percent of it beef and veal, 35 percent pork, 4 percent poultry, and 25 percent other meats. Although Norway's population is no longer growing, incomes are rising, and meat consumption is forecast to grow about 0.5 percent annually.

Table 8.—Norway: Consumption of packaging materials by the food processing industry, 1978

Packaging material	Quantity	Units
Corrugated cardboard cartons	142,000	metric tons
Folding boxes	27,500	metric tons
Other cartons	42,100	metric tons
Paper bags	31,000	metric tons
Plastic bags	13,837	metric tons
Plastic bottles	647	metric tons
Plastic cups and boxes	14,426	metric tons
Plastic lids and caps	1,104	metric tons
Glass containers	287,050	metric tons
Aluminum cans	1,207	metric tons
Aluminum foils	4,560	metric tons
Aluminum caps	40,186	metric tons
Tinplate cans	40,186	metric tons

Source: See source notation of table 1.

Producer cooperatives are the source of over three-fourths of Norway's raw meat supplies. Some coops also process and market the meat. Major processed meat vendors include Rogaland Fellessalg, Vestfold-Buskerud, Hedmark og Opland Slakterier (HED-OPP), Nord Norges Salgslag, Ostfold Slakteri, and Bye Opdahl. Two prominent slaughterhouses are Agro Fellesslakteri and Fellesslakteriet. Stabburet-Lade and Ringstads dominate meat packaging.

Lagging productivity is a problem in this sector: output per worker-hour is only about half as high as in the United States. But increased output of processed foods and the trend toward larger firms should bolster productivity during the 1980's. Productivity increases of almost 1.3 percent per annum are expected during the 1978-1983 period. The anticipated reduction in Government subsidies for meat products will also spur investment to raise output per worker. Manufacturers of processed meat expect to boost their purchases of new processing equipment 6 percent per year, to $20 million in 1985. Many establishments make as many as 30 different products, so each production run is relatively short. Norwegian processors want equipment that is both capable of high speeds and suitable for short runs.

Some processing operations, such as sawing, bone chopping, and poultry eviscerating, are already mechanized. The most modern slaughterhouses have installed completely automated skinning and boning equipment capable of handling over 200 quarter carcasses per worker-hour. Automation lags in other aspects, such as cutting and portioning. Sausage-makers expect to invest in more automatic machinery at all stages of the production line. Interest is greatest in vacuum cutter mixers, which improve shelf life and taste by eliminating oxygen from the sausage mixture.

Experts predict that changing eating habits will also stimulate purchases of new machinery. As American fast food chains popularize hamburgers, there should be growing demand for meat grinding equipment. Quick freezing equipment is already being bought by many food processors as more Norwegian households acquire deep freezers. Freeze-dried meats (especially sausages and frankfurters) are also becoming more popular, presaging increased demand for hot boning, freeze drying, and transportation equipment.

Meat, poultry, and egg processors spent $4.7 million on packaging machinery in 1980 and expect their purchases to jump 8 percent annually to almost $7million in 1985. Automatic packaging equipment should be in particular demand as meat processors offer new lines of convenience foods. Growing supermarket sales of small, prepackaged portions of meat and eggs mean fewer bulk sales, making packaging ever more important. Meat is sold already cut and packed in cryovac film, eggs are packed by the half dozen in cardboard boxes, and sliced ham is sold in polypropylene film. Plastics accounted for almost a third of the $32 million in packaging materials consumed by this sector in 1978. Corrugated cardboard (29 percent) and tin cans (21 percent) were the next most important packaging materials.

Dairy product manufacturing.—Small establishments operating under the umbrella of the cooperative, Norske Melken Produsenters Lands forbund, are the rule in the dairy products sector. Only 2 firms have over 200 employees. Of the 215 establishments, 190 produce milk and milk products, 8 are cheese makers, and 17 manufacture ice cream. Among the major processors of milk, butter, cream, and juices are Fellesmeieriet, Trondermeieriet, and Bergensmeieriet. Iskrem (a subsidiary of Trondermeieriet) produces ice cream, and Nestle is a leading supplier of condensed milk and milk powder.

Total sales of dairy products in 1979 approached $660 million. Most of output is consumed in the home market, though Norwegian Jarlsberg cheese, distributed by Norske Meierier Salgsentral, sells well in the United States and other overseas markets. Imports of dairy products are as limited as exports. Norway's domestic suppliers provide all of the country's milk, cream, and butter, 94 percent of the powdered milk, and 99 percent of the cheese consumed. Total sales of dairy products are forecast to increase almost 3 percent yearly in the early 1980's, and employment, currently 6,500 persons, is projected to rise 1 percent per year.

As in America, consumers are noticeably changing the mix of dairy products they buy. During the 1980-1985 period, calorie-conscious Norwegians are expected to cut their consumption of whole milk 1.2 percent a year and increase their consumption of skim milk at a 5 percent annual rate. Industry analysts predict that cheese purchases will increase about 1 percent per annum, and yogurt consumption is also on the rise. Ice cream sales are booming, prompted partly by rising freezer ownership, partly by increased consumption of carryout foods, and partly by increased real incomes as adults begin to favor the more expensive ice cream desserts. Production of ice cream soared from 26,000 MT in 1973 to 33,000 MT in 1978. Additional expansion to 37,000 MT is foreseen by 1983.

Boasting capital expenditures of $49 million in 1979, the dairy products sector has one of the highest ratios of capital expenditures to sales in the Norwegian food processing industry. Half of capital outlays are for new processing equipment. Trade sources expect the sector's purchases of new equipment to rise 3 percent annually to over $32 million in 1985 as dairies diversify into new product areas and consolidate into fewer, larger firms.

Dairy products manufacturers are large users of highly automated equipment. Iskrem employs two computers (one online, one backup) to integrate four crucial operations in its ice cream manufacturing process: receiving and routing various ingredients; formulating and blending ice cream mixes; directing the product through freezing, hardening, and storage; and sequencing complex cleaning in place (CIP) routines. Cheese-making and filling are also automated, with the larger firms using Alfa-Laval's Tebel/OST III cheese-making tanks and units for whey drainage, pressing, batching, and mold filling. Pneumatic tunnel presses are used for the final pressing of cheese. But cheese handling and storage are still performed manually. Because of high labor costs, cheese makers would like to automate these activities. Due to Government subsidies there is currently excess capacity for producing fluid milk and butter, but more facilities are needed to meet the increasing demand for yogurt, cottage cheese, ice cream, and dairy dessert products. Equipment vendors can expect these new facilities to be highly automated.

Purchases of packaging equipment are projected to climb 4 percent annually to $12 million in 1985. Automatic filling machines for milk and yogurt are already in extensive use. These hygienic fillers, mostly supplied by TetraPak of Sweden, are flexible enough to be used for various types of liquids. Although simple to operate, the fillers have a capacity of 7,200 packs per hour. As in other sectors, the growth of supermarket shopping gives increased importance to dairy packaging. Processors offer cheese already sliced and packaged and sell ice cream in family-size packages. The restaurant trade also uses more individual portions of butter, cheese, and cream, packed in aluminum foil or thermoform packets.

Norwegian milk producers pack their products in plastic-coated paper containers, while processors of margarine, yogurt, and cottage cheese use rigid plastic containers. Butter manufacturers often use tubs made of a combination of an outer layer of clear plastic film, a middle layer of board carrying graphics, and an inner layer of white plastic. TetraPak's recently introduced polystyrene TetraCup can be shaped and filled directly in the dairy.

Preserved fruits, vegetables, and specialty products.—This rapidly modernizing sector is forecast to increase its purchases of processing equipment by 5 percent annually, reaching a level of nearly $8 million in 1985. Processors are interested in advanced technology. Freeze drying is common for vegetable processing, and dehydration is becoming popular for soups, spreads, and sauces. Aseptic systems are of major interest to manufacturers. High-speed continuous systems are seen as a means of contending with high labor and energy costs and improving product quality. Two leading firms, Nora and Denofa, are considering buying microprocessor-based data logger systems for refrigeration control and monitoring. As working women purchase more processed vegetables, there should be increased demand for high-capacity fillers. Jam producers expect to replace old vacuum pan systems with continuous closed systems to cut costs and improve quality. Among juice producers, demand is strong for new types of dry sugar feeders, mixing units, feed pumps, and heat exchangers to reduce sugar consumption and save on steam, coolant, and labor costs. Pasteurizing and cooling tunnels suitable to smaller containers are also considered salable.

Spending on packaging equipment is projected to grow at a brisk 7 percent annual rate to over $3 million in 1985. Multimaterial packaging lines are being installed by the sector's leading firms. Soups are normally packed in plastic "chute" bags. Most juices are aseptically packed.

In 1979 the 41 firms in the sector employed almost 1,600 people, about 3 percent of the food processing industry total. Employment will drop slightly in the next few years, but the increasingly automated freezing and canning plants should produce 4 to 5 percent more each year in spite of the decrease in employment. Production had already increased a phenomenal 200 percent between 1960 and 1978. Juice consumption, projected to rise by more than 5 percent yearly over the 1978-83 period, is the fastest growing area in the preserved fruits and vegetables sector. Sales of all frozen products will probably grow at a faster than average rate, largely because of increased acceptance and demand by restaurants and institutional kitchens.

Over 98 percent of processed fruits and vegetables are consumed domestically. In addition, 54,000 MT of preserved fruits and vegetables are imported. With only limited arable land and a short growing season, Norway must also import one-third of the raw vegetables and almost 65 percent of the fruits used by the processing sector. Fruit for the rapidly growing juice market is almost all imported.

Among the major producers in the sector are Riber Son Konserver, which make soups, gravies, stews, and casseroles. Stabburet, Denofa og Lilleborg, and Nora Sunrose produce preserved fruits, vegetables, and jams. In addition, Agra Margarinfabrik and Maarud Bedrifter manufacture potato products, and Borgar Fabrikker makes fruit desserts.

Grain mill products.—Sales of grain mill products, including animal feeds and pet food, amounted to $703 million, or 14 percent of processed foods sales in 1979. Virtually all the sales were to the domestic market. Norwegians, like other consumers with rising incomes, are including less bread in their diets and the grain mill products sector is compensating by promoting new products such as prepared flour mixes for cakes and biscuits.

Consumption of the traditional Scandinavian dark breads has tumbled, pulling down output of milled rye. In 1978, the volume of rye milled annually had fallen to 57,000 MT, 90 percent of the production level of 5 years earlier. A further decline to 45,000 MT is anticipated by 1983. Increased demand for wheat flour has more than offset the decline. Production of wheat flour rose 4 percent a year from 1973 to 1978, and a modest .5 percent annual increase to 261,000mT is anticipated by 1983. Output of cake mixes jumped 5.6 1 percent a year from 4,500 MT in 1973 to 5,900 MT in 1978. An additional increase of nearly 3 percent is predicted annually through 1983.

Most of the 2,400 employees in the sector work for establishments hiring fewer than 50 people each. No firm has more than 200 workers. Bjolsen Valsemolle in Oslo is a prominent grain miller.

In 1980, establishments making grain mill products purchased $6.5 million worth of new processing equipment and $1.7 million worth of new packaging machinery. Mills expect to expand their purchases of processing machinery by only 2 percent annually to about $7 million in 1985. Buyers in this sector prefer German, Swiss, and Finnish machinery for milling the soft wheats grown in Norway. Some grain millers have begun to install electronic controls to monitor and regulate grain level in silos. Investments in new packaging equipment are also forecast to show only modest 3 percent annual growth, to $2 million in 1985.

Bakery products.—Only 2 of the 824 establishments manufacturing bakery products have more than 200 employees; most firms are small. In 1979, sales amounted to $232 million, or about 5 percent of processed foods turnover. The sector had 7,500 people on the payroll in 1979, making it the third largest employer in the food processing industry. But employment is forecast to decrease almost 1 percent per year to 1983, due in part to the steady decline in bread consumption.

Output is highly fragmented: the top eight firms account for only 21 percent of total production. One of these, Vestfold Flatbrodfabrik, accounted for 11 percent of bakery output. The other top seven are Mollhausen, Saetre Kjeksfabrik, Ditlef Martens, Dampbageriet, H.M. Hansen Sonn, Stulens Lefse og Lompebakeri, and Foreland og Gehab. Most Norwegian bakeries serve a neighborhood or a local market. Each firm produces a large variety of breads, duplicating the equally broad assortment offered by neighboring establishments. In the future, bakers expect to specialize a bit more, with the larger companies aiming at national distribution and the smaller bakeries maintaining a local or regional market. The sector is aware of economies of scale. Industry analysts estimate that firms with 100 or more employees sold 35 percent more bread per worker in 1978 than firms with fewer than 50 employees.

Most of the larger bakeries already have advanced machinery such as continuous operation, flow-through ovens, and they already mix their dough in a continuous process rather than in batches. For these large firms, wire mesh ovens are standard in many new installations. In the major cookie and cracker factories, automation is the norm in all operations from mixing to packaging. But the small firms remain very labor intensive. Labor costs account for almost 25 percent of total sales value, making the bakery sector the most labor-intensive in the food processing industry.

Despite trends toward rationalizing production and distribution, the hundreds of small bakeries will continue to dominate the sector. As a result, demand is strongest for semiautomated equipment such as tray feed ovens and kneaders of 100-200 liter capacity. Only limited demand is foreseen for fully automated continuous ovens and automated slicing and packaging lines. Purchases of new processing machinery should climb by a healthy 6 percent annually to well over $6 million in 1985.

Packaging costs amount to 5-6 percent of the sector's total sales. In 1978, bakeries invested $1.2 million in food packaging equipment and used $12 million worth of packaging materials. Plastics accounted for 40 percent of the material consumed. Since bakers are doing more of their own packaging, trade sources expect purchases of packging machinery to rise an impressive 8 percent yearly, to $2 million in 1985.

Sugar and confectionery products.—Norway manufactures no sugar, so no demand exists for sugar processing or packaging machinery. However, 12 firms manufactured chocolate and confectionery products that sold for $175 million in 1979. Confectionery output accounts for over 3 percent of the food processing industry's annual turnover, and is forecast to grow by 2.5 percent per year. Projections to 1983 indicate a production volume of over 27,000 MT: some 8,000 MT of sugar confectionery and 19,400mT of chocolate.

Chocolate and confectionery manufacturers employed almost 2,900 people in 1979 and are projected to expand their labor force 1 percent each year through 1983. In contrast to most other sectors, large firms make up more of the chocolate and confectionery producers in Norway. Half of the establishments employ more than 50 workers. Freia, with 46 percent of sales in 1978, is the single largest producer. Kiellands, which manufactures chocolates and sugar confectionery, is the second largest. Brynildsens Fabrikker (candy and chewing gum) is third, and Den Kooperative Landsforenings Sjokoladefabrik rounds out the top four, which together accounted for 60 percent of production in 1978.

Brynildsens purchased $2 million worth of new equipment in 1978, including gum producing machinery. The firm expects to make future investments in a large-scale cooling system, replacing a large number of small compressors currently in operation. Continuous belt coolers are already used by most leading plants. But having made sizable investments already, producers are foreseen increasing their future purchases of processing machinery only a modest 1.6 percent a year to $3.2 million in 1985.

Chocolate and candy producers have to import all of their raw materials, primarily cocoa beans and sugar. Spurred by high world prices for these commodities, candy manufacturers are trying to find substitute ingredients, and future equipment requirements may well depend on the results of this research.

Chocolate and candy producers made large investments in automated packaging machinery during the late 1970's, and expect to expand purchases still further to meet the demand for small, individually wrapped snacks. Purchases of packaging equipment in 1985 will probably reach $1.2 million, up from $930,000 in 1980. High-speed packaging lines with accurate electronic weighing apparatus characterize the equipment in demand. Paper and aluminum foil will continue to be the dominant materials used for packaging.

Fats and oils.—The 84 firms producing edible fats and oils employed almost 3,400 people in 1979 and had sales of $535 million. Twenty percent of the sales were exports. This sector is closely linked with fish and seafood processing. Seventy percent of the firms in the sector make fish oils and fish meal, and 45 percent of total fats and oils production consisted of fish oils and fish meals. Animal fats (including butter) accounted for 37 percent, margarine for about 11 percent, and vegetable oils for 7 percent of gross value of production.

Most of the leading firms in the sector are margarine producers. Forenade Margarine Fabrikker, the parent company of Delikat Fabrikker, Marga, and Mills, serves as the export organization for all the margarine firms in the country. Other leading producers are Denofa, Mesna Margarinfabrik, Agra Margarinfabrik, Borgar Fabrikker, and Pals.

The ample availability of butter at low prices in Norway has cut into sales of margarine and other fats and oils. Norwegian consumption of edible fats declined 5.5 percent during the 1970-78 period and further reductions are anticipated. To compensate for this, several margarine processors are adding new product lines, among them Denofa (preserves, jams, cake mixes, and animal feeds), Forenade Margarine Fabrikker (mayonnaise, mustard, ketchup, fruit juices and concentrates), and Borgar Fabrikker (juice and ketchup).

Since automated processing is already standard in the large firms that dominate production, industry observers expect purchases of new processing equipment to increase only a modest 3 percent yearly to about $19 million in 1985. Purchases of new packaging equipment should advance at about the same rate, reaching almost $5 million in 1985. Large firms use high-performance machines to pack margarine in 250-gram thermoformed plastic cups. Expanding sales of individual servings of margarine to hotels and restaurants also spur purchases of appropriate packaging machinery.

Beverages.—Twenty years ago, Norway boasted 20 breweries and 119 soft drink manufacturers. But, as a result of the quest for production economies, the numbers dropped sharply, to 17 breweries and only 37 soft drink manufacturers in 1978. A total of 69 firms, with an annual turnover of $395 million and 5,100 employees, now make up the sector. Consumption of soft drinks has risen in recent years, while the demand for domestic beer is stagnant. Result: the number of brewery workers is declining while soft drinks employment is up. As incomes rise, consumers are experimenting with imported beers and drinking more hard liquor, leading to expanded sales of mixers such as ginger ale and tonic water.

The three major beverage producers are Nora Industrier, Hansa Bryggeri, and Dahls Bryggeri. Nora is dominant, producing 45 percent of the country's beer and almost 35 percent of the soft drinks. Other well-known companies include Arendals, Hamar, Farris, and Borg.

The country's small breweries are unlikely to spend much for new equipment, but the big three plan to invest substantially. Purchases of new processing equipment should grow about 3 percent a year to well over $9 million in 1985. The large brewers have the financial base to invest in large-scale automated equipment to improve profitability. They are interested in continuous flow processing methods, high-capacity cooling equipment, and automated filtering machines. Computerized process control instruments are also increasingly popular as brewers try tc trim energy consumption. The state of the art is represented by a brewery in Oslo that requires 3 kg of fuel and 8 kilowatt-hours of electricity to produce 100 liters of beer. Soft drink manufacturers, who are also trying to cut energy costs, plan to replace conventional batch operations with continuous liquid sugar production systems. Bottlers find these attractive for their high heat recovery, reduced steam consumption, and considerable water and ingredient savings.

Investment in packaging machinery is projected to expand at a 5.5 percent annual rate to almost $4 million in 1985. Most of the $79 million worth of packaging materials used by the beverage sector in 1978 was glass. There is little interest in cans, which are heavily taxed by the Government, and plastics are not popular for beverages either.

Fish and seafood.—In Norway, one the world's leading fishing nations, fish and seafood processing is among the most important sectors in the food industry. Fish and seafood processors employed over 14,000 people in 1979, a quarter of the industry's payroll. Their sales of $770 million ranked second only to sales of meat, poultry, and egg products. And with capital expenditures of $43 million, the sector is a major force in the domestic economy. About 23 percent of total sales go to overseas buyers, making fish and seafood important to Norway's foreign trade as well.

Most of the 672 establishments in the sector are small plants hiring fewer than 50 people, but the trend is to fewer and larger firms. Between 1960 and 1978, the number of producers dropped dramatically: sardine packers from 86 to 24, shellfish processors from 94 to 14, and mackerel canners from 26 to 7.

Frinor, with sales of over $200 million, is the largest processor of fish, accounting for one-fourth of the sector's output. Chr. Bjelland ($24 million in sales) is the leading producer of canned fish. Other major firms are Brodr Aarsaether ($40 million), Nordic Group ($35 million), and Findus ($30 million), a subsidiary of Switzerland's Nestle. Some of the leading firms with annual turnovers of $2 million to $5 million each are: Melbu Fiskeindustri, Njord Handels, Helge Richardsen, Stavanger Preserving, Elling Aarseth, and Trondhjem Canning and Export.

The larger, more efficient firms produce enormous quantities of processed fish to meet the growing demand of Norwegian consumers. Increased fish consumption, which is one of the targets in the Government's nutrition and food policy, is projected to approach 170 thousand MT in 1990, up from 133 thousand MT in 1980.

Raw material availability poses a problem, however. Because traditional Norwegian fishing grounds have been overworked, catches are declining and fish prices are rising. The higher raw materials prices are prompting the industry to seek new processing methods to reduce product waste, currently about 52 percent of total fish tonnage. Fish and seafood processors expect to purchase over $12 million in new processing equipment in 1985, representing growth of 4 percent yearly over 1980 levels. Buyers want equipment for use both on land and on the fishing vessel, especially improved slaughtering, opening, and scaling machines.

Manual handling still predominates in many operations, such as filleting and shrimp peeling. With wage rates rising, manufacturers are looking for new labor-saving techniques and semiautomatic equipment to cut costs. Buyers are eager to mechanize the trimming function, for example. Good demand is also reported for autoclaves and flexible homogenizers. Freezing is becoming important as more frozen seafood dishes find their way into supermarket cases. Many processors, especially sardine and crabmeat packers, have already invested heavily in freezing room equipment, but there is still room for improvement.

If, as projected, the sector's purchases of packaging equipment reach over $15 million in 1985, they will represent nearly 30 percent of the new packaging equipment bought by the entire food processing industry. Strong interest is reported in automatic fish packaging lines that include transporters, weighing machines, and labeling equipment.

Processors usually pack frozen fish in aluminum trays and market other preserved seafoods in metal, tinplate, and glass containers. In the future, packers expect to use more of the cardboard boxes and polystyrene vacuum bags favored by self-service and chain stores.

Miscellaneous food products.—Producing such items as coffee, tea, snack foods, pasta, cereal, spices, puddings, and condiments, the 113 establishments in this sector had 1979 sales of $322 million. Most of the 2,700 employees work in small firms that are primarily active in other areas of food production and sell miscellaneous foods only as a sideline. Several margarine factories such as Forenade Margarine Fabrikker and Agra Margarinfabrik are diversifying into this sector.

Industry observers anticipate continued expansion in snack foods consumption, as well as output increases of almost 20 percent for vinegar, mustard, mayonaise, and yeast and baking powder between 1978 and 1983. Other products show less promise. Once a nation of coffee drinkers, Norwegians have decreased their coffee consumption almost 23 percent since 1976. Breakfast cereals are not very popular, and consumption is increasing only slightly.

It is the growth in snack foods and condiments that will call for investments in processing and packaging equipment. Miscellaneous foods producers expect to purchase almost $11 million in new processing equipment in 1985. Snack food producers such as Maarud Bedrifter and Gaute Naeringsmiddelindustri are especially interested in snack food sizers and shapers. Packaging equipment sales are expected to climb about 3 percent annually to nearly $3 million in 1985 as the industry deals with packaging requirements for new products and individually wrapped portions of many snack foods.

Marketing Practices

A U.S. manufacturer entering the Norwegian market for food processing and packaging equipment should select a technically strong Norwegian sales agency as its representative. Most of the approximately 200 foreign manufacturers selling to the Norwegian food and beverage industry operate through 60 such sales agencies. Danish and Swedish firms, because of their proximity, sell directly to Norwegian end-users. The U.S. vendor should take care to choose a representative who can convince the cautious Norwegian buyer of its ability to carry through on service. The availability of a service contract often closes a food processing and packaging equipment sale.

Depending on the services provided, the agent's commission ranges from 25-30 percent for machinery costing $3,000 to $10,000, 12-20 percent for equipment costing $10,000 to $100,000, and 11-15 percent for machines priced at over $100,000. While price is important in sales of standard simple machines, for more complex equipment, the Norwegian buyer gives more weight to versatility, reliability, and potential cost-savings.

Vendors promote their products through the media, trade literature, field sales, and exhibitions. International trade magazines and direct visits to customers are the principal sales tools.

Trade and Technical Regulations

U.S. equipment sold in Norway carries a tariff of 8 percent of the c.i.f. price. Equipment imported from EFTA and Common Market countries enters Norway duty free. All imports, as well as all domestically produced equipment, are subject to a value-added tax of 20 percent, levied on the c.i.f. price plus customs duty.

Electrical equipment must conform to the Norwegian system, which is 380/220 volt a.c. single and three-phase 4-wire, 50 cycles. Special permits are required for frequencies higher than 600 volt, 200 cycles.

Norway: Best Sales Opportunities for U.S. Exporters of Food Processing and Packaging Equipment

Meat, Poultry, and Egg Processing Equipment
- Frozen meat flakers/slicers/cubers
- Boning machines
- Power cleavers Sausage stuffing machines

Dairy Products Manufacturing Equipment
- Milk irradiators

Fruit and Vegetable Processing Equipment
- Juice extractors
- Abrasive peelers
- Continuous blancher/cooker/cooler/sterilizer systems
- Dehydrating equipment
- Vacuum destoners

Bakery Products Manufacturing Equipment
- Pie machines

Sugar and Confectionery Products Manufacturing Equipment
- Tableting machines

Beverage-Making Equipment
- Concentration control equipment for soft drinks, flavoring extracts, and syrups

Miscellaneous Food Products Manufacturing Equipment
- Potato chip sizer-halvers/slicers/fryers
- Snack food extruders

Multi-Product and General Purpose Food Processing Equipment
- Liquid nitrogen tunnel freezers
- Continuous IQF (instant quick freeze) system

Additional Information

The project officer responsible for Country Market Surveys on Food Processing and Packaging Equipment is:

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

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Washington, D.C. 20230

The Survey summarizes an 89-page International Market Research (IMR) report prepared by A.B. Konsulterna in Stockholm under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Norway and not those of the Department of Commerce. The IMR report gives more detail on the points touched upon in the Survey, as well as marketing practices, trade regulations, technical and labeling requirements, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk Telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Food Processing and Packaging Equipment in Norway," DIB 81-09-502, July 1981.

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Country Market Survey

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Laboratory Instruments

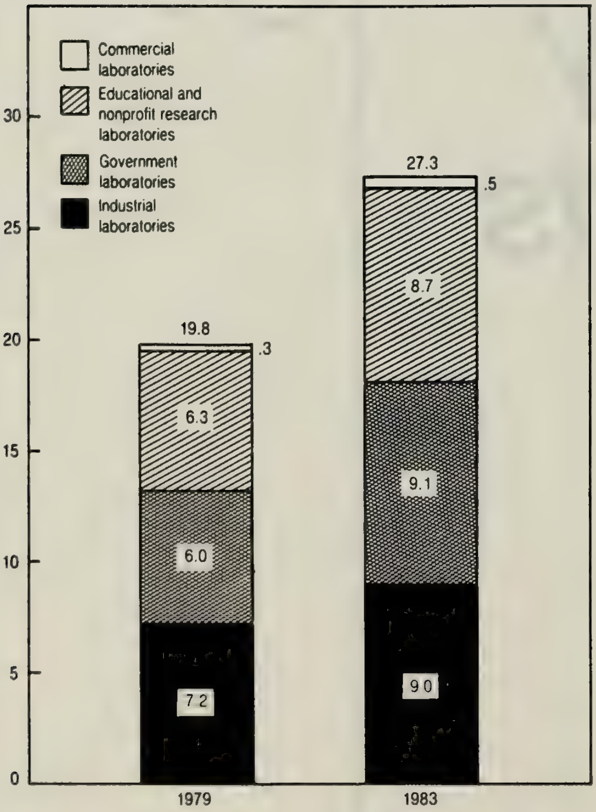
Norway

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The Norwegian market for laboratory instruments, though a relatively small $24 million in 1981, is forecast to show healthy expansion over the next few years. Sales are projected to rise at a 7 percent annual pace to $33 million[1] in 1986 as laboratories acquire advanced instruments to develop new petroleum-based products, strengthen the country's technical education facilities, and offset a shortage of trained research personnel (see table 1 and figure). Though constrained by the world oil glut, production of North Sea oil picked up marginally in early 1982. Petroleum revenues should be sufficient to support such expansion plans, offering a favorable environment for U.S. sales. American vendors are expected to increase their shipments to Norway a brisk 9 percent a year, with sales of laboratory instruments forecast at $12.7 million in 1986 (see table 2).

Norway: The market for laboratory instruments 1979 and projected 1983

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research report; values based on Norwegian trade source estimates.

Table 1.—Norway: Size of market for laboratory instruments 1979, 1981, and projected 1986

(in thousands of U.S. dollars)

	1979	1981	1986
Production	1,200	1,400	1,800
Imports	18,720	22,570	31,600
Exports	160	190	260
Market size[1]	19,760	23,780	33,140

[1] Market size equals production plus imports minus exports.
Source: Values based on Norwegian production and trade statistics and trade source estimates.

In the past Norway has allocated a relatively meager portion of gross national product (GNP) to R&D (only 1.4 percent in 1979), in part because the country's economic activity has focused on extractive industries and shipping. But two recent government studies have called for dramatically increased R&D expenditures, and the Government now proposes to raise public R&D funding by 50 percent in the coming 3-5 years. As a result, government laboratories are projected to account for an expanded 33 percent of instrument purchases in 1983, up from 30 percent in 1979 (see table 3). Moreover, government funds will also go to educational institutions, which expect to invest substantially in new equipment to upgrade existing laboratories, develop several research specialities, and establish national and regional research centers. With purchases that are forecast to grow at an 8 percent annual pace over the next few years, educational organizations are likely to account for 32 percent of the Norwegian laboratory instrument market. Industrial laboratory spending, meanwhile, is constrained by a stagnant world market and is projected to rise a more modest 6 percent per annum through the first half of the decade.

Table 2.—Norway: Imports of selected laboratory instruments, 1979, 1981, and projected 1986

(in thousands of U.S. dollars)

	1979	1981	1986
United States	6,540	8,260	12,700
Germany	4,390	4,540	6,300
United Kingdom	2,050	2,870	3,200
Others	5,740	6,900	9,400
Total	18,720	22,570	31,600

Source: Values based on Norwegian production and trade statistics and interviews with manufacturers' representatives, sales agents, and end-users.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1 = 5.05 NKr (1979) and 5.72 NKr (1980 and subsequent years). Values through 1980 are expressed in current rather than constant dollars; values for 1981 and subsequent years are expressed in 1980 constant dollars.

Competitive Environment

Imports dominate the Norwegian laboratory instrument market. Local vendors manufacture only a limited range of simple instruments, capturing about 5 percent of sales. As laboratories turn to more sophisticated equipment, the domestic share of the market is projected to decline slightly to 4.7 percent by 1986.

American manufacturers rank first among foreign suppliers to the Norwegian market. Their sales of $8.3 million in 1981 accounted for 37 percent of imports, and U.S. competitors are forecast to broaden their sales base to some 40 percent of imports in 1986. Ever since the Marshall Plan brought U.S.-built laboratory instruments to Norway in the late 1940's, American companies have been on the leading edge in developing and marketing new instrumental methods of analysis. Moreover, they offer full lines of equipment and enjoy a reputation for providing technologically unsurpassed instruments at reasonable prices. Relatively close scientific ties between the two countries and the professional stature of American scientists help consolidate the image of U.S. firms as world leaders.

Industry analysts suggest that American firms could expand their share even further by shipping from U.S. factories (where quality is said to be higher) rather than from some third-country subsidiaries. Leading users could also be invited to visit American manufacturing facilities for training and information. Other promotion techniques offered by trade sources include intensive marketing through a sales subsidiary, close cooperation with a local representative, and direct contact with influential Norwegian Government research organizations.

Major U.S. laboratory instrument manufacturers do well with a broad range of products. Prominent vendors of full equipment lines include Perkin-Elmer, Beckman Instruments, Hewlett-Packard, Varian Associates, Orion Research, Tektronix, DuPont, and Fisher Scientific. Also successful are such American companies as Bausch & Lomb, Coulter Electronics, Ultra-Violet Products, Infrared Industries, Instrumentation Laboratory, American Optical, and Finnigan.

Among third-country competitors, German firms captured about 20 percent of imports in 1981, a share they are expected to retain through 1986. These vendors do well with microscopes, laboratory glassware, electrophoresis apparatus, physical properties testing equipment, photometers, and spectrophotometers. The past few years have seen a slight erosion in Germany's share, apparently because the strong deutschemark in the late 1970's cut into the competitiveness of German-built products and prompted some multinationals to ship to Norway from other factories. Leading German suppliers include Leitz (microscopes, photometers), Carl Zeiss (microscopes, spectrophotometers), Siemens (X-ray diffraction apparatus), and Hartmann & Braun (pH meters).

After declining for several years, shipments from U.K. factories rebounded in the 1979-81 period, amounting to 12.7 percent of imports in 1981. Several successful multinationals (BBC of Switzerland, Philips of Holland, and Beckman, Perkin-Elmer, and Finnigan of the U.S.) ship to Norway from British plants, and Cecil Instruments, a U.K.-owned concern, does well with spectrophotometers and accessories for chromatographic systems. Because of quality control problems, currency fluctuations, and missed deliveries caused by labor unrest, trade sources predict a decline in the U.K. share of imports to 10 percent ($3.2 million) in 1986.

Japanese firms are slowly but steadily gaining ground on the Norwegian market. Such companies as Olympus, Kyowa, and Shimadzu capture about 40 percent of the market for microscopes, while Hitachi Scientific Instruments, Jeol, and Shimadzu are expected to increase their sales of spectrometers and spectrophotometers. Japanese vendors generally receive high marks for prices, sales and service support, and prompt deliveries. Other prominent third-country suppliers include Switzerland's Mettler Instrumente (balances) and Kontron (spectrophotometers), Sweden's LKB Produkter (chromatographs), Denmark's Radiometer (pH meters), and East Germany's Jena (laboratory glassware), and Liechtenstein's Balzers (spectrometers). French and Italian suppliers play a minor role in the market.

Norway's five domestic manufacturers of laboratory instruments have only a marginal role in the market, supplying equipment valued at $1.4 million in 1981. Industry observers note that few Norwegian instrument buyers are even aware that there is any domestic production. Output is forecast to rise at a 5 percent annual pace to $1.8 million in 1986. The industry's exports, valued at $190,000 in 1981, are projected to hit $260,000 in 1986. Despite the Norwegian Government's push to encourage R&D activity, it has lent no support to local equipment manufacturers other than a 7 percent tariff on imports from outside the European Economic Community and the European Free Trade Association.

The range of domestically produced instruments is limited. Sigurd Sorum manufactures pH meters; Laboglas produces laboratory glassware; Heger Plastics offers plastic disposables for laboratory use; and Termaks builds laboratory incubators. All of these small, locally owned firms produce laboratory equipment only as part of a broader output mix.

Selected Product Markets

The fastest growth in the Norwegian market is predicted for *chromatographs*. Sales are projected to rise a rapid 14 percent per annum, almost doubling from $2.1 to $4.1 million over the 1981-86 period (See table 4). Gas chromatography is currently the

Table 3.—Norway: Laboratory expenditures by major end users, estimated 1979 and projected 1983

(in millions of U.S. dollars)

	Number of laboratories	Laboratory expenditures		Purchases of laboratory instruments	
		1979	1983	1979	1983
Government	230	240	342	6.0	9.1
Educational and nonprofit institutions	420	200	276	6.3	8.7
Independent commercial laboratories	11	4	5	.3	.5
Industry					
Oil and gas extraction	5	16	25	.6	1.0
Food products	16	10	12	.4	.5
Chemical	23	35	39	1.8	2.2
Petroleum	5	2	3	.4	.5
Rubber and plastic products	7	6	7	.4	.5
Stone, clay, and glass	8	4	5	.2	.3
Primary metals	38	28	37	1.0	1.2
Fabricated metal products	47	10	15	.4	.5
Transportation	32	13	16	.6	.7
Other	75	77	110	1.4	1.6
Total	917	645	892	19.8	27.3

Source: FoU Statistikk 1979 and trade source estimates.

most popular of the chromatographic techniques, especially in government laboratories. On the other hand, liquid chromatography, especially high-pressure liquid chromatography (HPLC), offers the greatest future potential. HPLC is already considered indispensable in Norway's pharmaceutical, biochemistry, and environmental chemistry laboratories. Researchers are impressed by the flexibility and capacity of liquid chromatography. Buyers can choose systems with single or double sets of pumps. They can add ultraviolet (UV), electrochemical, refraction index, or fluoresence detectors. And they can use different types of injection systems and computerized control systems. Combination instruments integrating spectrometry for liquid and gas chromatography are said to have an excellent market. However, thin layer chromatography is practically unknown in Norway.

U.S. firms offering modular design and computer-integrated instruments dominate the market for chromatographs, capturing some 70 percent of sales. American suppliers introduced chromatography to the Norwegain market and are unlikely to be displaced by foreign rivals. Leading vendors include Hewlett-Packard, Perkin-Elmer, DuPont, Waters Associates, and Varian. Two recent entries from the U.S. are Kratos Schoeffel Instruments, marketing complete liquid chromatography systems, and Spectra-Physics, offering advanced HPLC systems. Among third-country vendors, only the U.K.'s Pye Unicam, owned by Philips, captures a significant market share.

In the market for *spectrometers*, U.S. manufacturers face tougher competition and hold only a 30-35 percent share. However, American sales are projected to grow at a faster-than-average pace as users demand computer linkups and the capability of integration with other analytical systems. By 1986, the market is projected at $3.3 million, up from $2 million in 1981. As basic items of laboratory equipment, spectrometers will be needed for many analytical tasks in the future. And as components of more complicated systems, spectrometers are expected to sell well in tandem with gas and liquid chromatographs. X-ray spectrometers are expected to find a good market in physical properties testing labs. Among U.S. vendors, Perkin-Elmer leads, followed by Hewlett-Packard and Varian. Finnigan, a leader in mass spectrometers, provides instruments from both its U.S. and U.K. plants. Third-country suppliers include Philips/ Pye Unicam (mass spectrometers and X-ray spectrometers) and Balzers (mass spectrometers).

Demand for **spectrophotometers** is sustained by the versatility and good price/performance ratio offered by these instruments. Sales are projected to expand nearly 12 percent per annum to $4.2 million in 1986. Main applications include education, quality control, and routine analysis in hospitals, research institutions, and petrochemical and pharmaceutical laboratories. Several U.S. firms are among the market leaders. Perkin-Elmer enjoys a strong position with its atomic absorption and infrared (IR) spectrophotometers, Hewlett-Packard does well with UV/visible

Table 4.—Norway: Sales of selected laboratory instruments, estimated 1981 and projected 1986

(in thousands of U.S. dollars)

	1981	1986
Chromatographs	2,100	4,100
Spectrometers	2,000	3,300
Spectrophotometers	2,400	4,200
Analyzers	2,600	4,300
Photometers	900	1,500
Densitometers	200	300
pH meters	900	1,300
Refractometers	400	700
Counters	500	800
Calorimeters	600	800
Hygrometers	100	200
Microscopes	2,900	4,700
Laboratory balances	200	400
Electrophoresis apparatus	500	700
Centrifuges/ultracentrifuges	400	700

Source: Values based on Norwegian trade source estimates.

spectrum (UV/VIS) equipment, Bausch & Lomb is prominent in double beam atomic absorption spectrophotometry (AAS), and Beckman succeeds with UV/VIS and IR instruments. Industry observers attribute the good current and projected U.S. position to a combination of American leadership in applying microprocessor technology to laboratory methods and persistent, sound marketing efforts. Other companies capturing a share of sales include Philips/Pye Unicam, supplying a broad line of UV/VIS, IR, and AAS instruments; Cecil (U.K.), with UV/VIS instruments; Kontron (Switzerland); and Zeiss (Germany). The Japanese firm Shimadzu is currently trying to establish itself with Norwegian users.

Analyzers represent one of the largest segments of the instrument market, with sales amounting to $2.6 million in 1981. Automated and computerized analyzers are expected to continue selling well through the first half of the decade, and a 1986 market of $4.3 million is forecast. Growing numbers of industries and institutions expect to employ computerized thermal analysis to study a variety of materials. Microcomputer-controlled elemental analyzers will be used on organic and inorganic compounds to test for carbon, hydrogen, nitrogen, and oxygen content. Complicated and time-consuming wet chemistry methods are on the decline. U.S. leadership in developing new techniques, such as Perkin-Elmer's thermal desorption system, ensures excellent prospects for American manufacturers, including Beckman, Instrumentation Laboratory, Technicon, and Coulter. Philips/Pye Unicam, Kontron, and Endress & Hauser (Germany) provide third-country competition.

A wide range of suppliers sold **photometers** worth $900,000 in 1981. Norwegian demand for these basic instruments will ensure steady growth in sales, to $1.5 million in 1986. U.S. vendors, including several small companies, face stiff competition not only from British and West German firms, but also from East Germany, France, and Japan. Both prices and the U.S. share of sales are likely to be forced downward over the next few years.

Norwegian laboratories purchased a mere $200,000 worth of **densitometers** in 1981. Since density is increasingly measured and analyzed by more sophisticated automated instruments, only modest growth is projected, to $300,000 in 1986. U.S. suppliers, such as Beckman and Bell & Howell, are expected to devote more time to marketing more profitable instruments, causing the American share of the market to drop somewhat from its current 30 percent. Beneficiaries of the decline will be such third-country rivals as Kipp & Zonen (Netherlands) and LKB (Sweden).

Although the **pH meter** is a fairly simple instrument, it remains in demand for many applications, especially since the introduction of microprocessor-based instruments has improved performance without raising prices. Sales totaled $900,000 in 1981 and are forecast to climb to $1.3 million by 1986, representing 8 percent annual growth. Replacement buying will provide most of the demand; new purchasers are expected to be such non-laboratory customers as the process industries, farmers, and aquaculturists. The largest supplier is Radiometer (Denmark), followed by Orion Research (U.S), Philips (Netherlands), BBC/Kent (U.K.), and Hartmann & Braun (Germany). Norway's own Sigurd Sorum captures about 5 percent of the market. The U.S. share, currently about 25 percent, is expected to dwindle under pressure from Sorum, Radiometer, and Japanese suppliers.

Sales of **microscopes** are projected to climb about 10 percent a year, from $2.9 million in 1981 to $4.7 million in 1986. Optical instruments account for about two-thirds of the market; electron microscopes for about one-third. Growth is expected to result from the improving price-performance ratio of both classes of equipment. New technology includes stereoscopic microscope systems, photomicrographic systems with and without microprocessor control, and scanning microscopes. Third-country vendors have long dominated the market for microscopes, giving U.S. suppliers little scope to increase their limited sales. German and Japanese manufacturers together control 75 percent of the market. Leading Japanese sellers include Olympus, Kyowa, Shimadzu, Nikon, and Jeol, while Zeiss and Leitz are the foremost German competitors.

Only a small market ($400,000 in 1981) exists for **centrifuges and ultracentrifuges,** although the need for such equipment in several industry, government, and educational laboratories is expected to push sales to $700,000 by 1986. U.S. firms capture less than 15 percent of sales. New Brunswick Scientific and

Beckman have sold some centrifuges here, but third-country manufacturers dominate. Prominent suppliers are Sweden's Alfa-Laval, Germany's Heraeus-Christ and Hettich-Zentrifugen, Switzerland's Kontron, and Finland's Labsystems.

Major Purchasers

The Norwegian Government provided about 60 percent of the country's $634 million R&D funds in 1979. But government organizations only accounted for 37 percent of R&D expenditures, disbursing the rest to universities and industry. Private industry, which provided 36 percent of R&D funding, accounted for 32 percent of total R&D spending, while universities accounted for some 30 percent. Industrial R&D is concentrated in the chemicals, machinery, metals, electronics, and oil and gas sectors.

Norway's newly expanded R&D program is expected to emphasize the oil and gas sector, which is generating income as well as providing new economic activity through forward and backward linkages to other sectors. Norway has also set its sights on developing a domestic microelectronics industry, and the Government is likely to allocate substantial R&D funds to basic and applied research in this field. Stringent environmental protection, health, and safety regulations are seen as a further stimulus to development of new products and processes by industrial laboratories.

Government organizations, which accounted for 37 percent of total laboratory expenditures in 1979, are forecast to boost their spending some 9.3 percent yearly to $342 million in 1983. Educational and other nonprofit research institutions are projected to make 31 percent ($276 million) of 1983 expenditures, and industry is predicted to account for 30 percent.

Purchases of laboratory instruments show the same pattern: fastest growth in spending should come from government organizations, followed by educational institutions and industrial laboratories. Independent commercial facilities account for less than 2 percent of instrument purchases. Biggest industrial buyers of laboratory apparatus include the chemical, transportation, primary metals, and oil and gas extraction sectors, all projected to spend $1 million or more on instruments in 1983. Several leading sectors are profiled below.

Government laboratories.—Government-sponsored research is channeled mainly through the Norwegian Council for Scientific and Industrial Research (NTNF). Most of NTNF's $90 million annual budget is distributed to government research laboratories, though some directly finances projects in private and public industries. Government organizations carry out R&D in 230 laboratories. The volume of work performed by public sector scientists is expected to rise sharply in coming years as the Government implements the recommendations of recent (1980 and 1981) reports on Norwegian R&D. The proposed increases in R&D funding will, in part, go to industry labs, but they should also mean substantial hikes in laboratory spending by government institutions.

A number of important public laboratories conduct research related to development of Norway's offshore resources. The Christiaan Michelsens Institutt (CMI) investigates measurement of oceanographic, meteorological, and marine technology; the Norsk Institutt for Vannforskning (NIVA) traces toxicological residues in fish and other marine life; the Norges Skipsforskningsinstitutt (NSFI) has four laboratories performing research in marine technology for exploiting the continental shelf; and Norges Hydrodynamiske Laboratorier (NHL) runs five laboratories investigating wave energy and offshore construction. Other major establishments in this sector and their research specialties include Det Norske Veritas, an independent but government-funded institution with 11 laboratories (electronic measurement methods and structural strength of heavy components); Forsvarets Forskningsinstitutt (explosives, electronics, underwater technology, security policy problems); and Institutt for Energiteknikk (process technology and nuclear energy). In addition, Sentralinstituttet for industriell forskning (SI), an institution with four laboratories, not only conducts research (high-polymer and high-temperature materials, biomedical techniques, environmental chemistry), but also administers a popular laboratory instrument rental service with an annual new equipment budget of $500,000.

Educational organizations.—Norway's educational institutions operate more than 400 laboratories. Current instrumentation in many school labs is said to be poor, and a plan outlined by the Norwegian Research Council for Science and the Humanities (NAVF) places a high priority on upgrading equipment. The NAVF plan also calls for establishment of national laboratories with expanded equipment budgets at several of the larger educational institutions. This sector is forecast to raise its spending on laboratory instruments at an 8 percent annual rate, to $8.7 million in 1983. Modern microprocessor-based analytical apparatus, now rare, is likely to be purchased in substantial quantities. These advanced research instruments would be shared by several organizations.

The major laboratories are those at four leading universities: Bergen, Oslo, Tromso, and Trondheim. The latter, with its relatively new University of Technology, spends the most on equipment. Integrated into the University is one of Norway's largest research institutions, the Foundation for Industrial and Technical Research (SINTEF), which specializes in metallurgical research, offshore technology, alternative fuels, wave energy, and corrosion research.

Laboratories in the chemical industry.—The chemical industry's sales amounted to $2 billion in 1979, while laboratory expenditures totaled about $35 million. The 23 laboratories operated by chemical companies are the largest industrial buyers of instruments. Their purchases, $1.8 million in 1979, are forecast to rise to $2.2 million in 1983. Microprocessor-based and computerized instruments are particularly well received in this sector.

Petrochemical firms run some of the largest laboratories. Norsk Hydro operates major research centers in Porsgrund (two laboratories) and in Rafsnes, Bamble. Norsk Hydro's fourth laboratory, in Karmoy, plans a slow but continuous expansion of its laboratory instruments inventory. Hydro also has a new geological laboratory on the drawing board: a Bergen facility slated to open in 1983. Saga Petrokjemi, another petrochemical giant, was run jointly by private enterprise and the State until three of the private companies left the organization early in 1982. Saga now faces problems in raising capital that will limit its ability to expand laboratory facilities, even though the firm reportedly plans to expand its production of polypropylene and polyethylene. Dyno, one of the private sector companies that pulled out of Saga, is planning a joint methanol plant with Statoil. The project, forecast to come on-stream in 1985, will reportedly include a modern, well-equipped laboratory.

Additional Information

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Country Market Survey

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Telecommunications Equipment

Norway

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The market for telecommunications equipment in Norway is forecast to jump from $198 million[1] in 1981 to $429 million in 1987 (see table 1). The Norwegian Telecommunications Administration's (NTA) ambitious plans for expansion of the telephone network serving the business and commercial community are expected to stimulate demand for telephone and telex equipment, while the development of new offshore production fields by the oil and gas industry could prompt a rise in data communications equipment sales.

Although government purchasing policy tends to favor locally-made equipment, the demand for increasingly sophisticated products is expected to spur imports. Purchases of foreign-made equipment topped $114 million in 1981 and are forecast to reach nearly $193 million in 1987 (see table 2). Over this period, U.S. companies are likely to see their share of the import market grow from close to 13 percent to 26 percent, with data, digital, and satellite communications equipment accounting for much of their sales.

Table 1.—Norway: The market for telecommunications equipment 1980-81, and projected 1987

(in thousands of U.S. dollars)

	1980	1981	Projected 1987
Telephone and telex equipment			
Local production	144,776	97,004	171,642
Imports	10,828	14,738	74,626
Exports (less)	4,528	8,228	16,716
Total	151,076	103,514	229,552
Transmission equipment			
Local production	23,808	27,865	69,552
Imports	3,075	5,257	13,898
Exports (less)	5,223	5,970	10,552
Total	21,660	27,152	72,898
Mobile radio			
Local production	22,388	25,373	37,373
Imports	18,367	18,559	31,432
Exports (less)	8,842	8,878	13,432
Total	31,913	35,054	55,373
Video and radio broadcasting equipment			
Local production	NA	NA	NA
Imports	15,265	22,859	44,002
Exports (less)	5,118	7,458	12,238
Total	10,147	15,401	31,764
Data communications equipment			
Local production	12,269	14,845	34,500
Imports	10,777	12,892	29,000
Exports (less)	8,588	10,392	24,000
Total	14,458	17,345	39,500
Total market			
Local production	191,167	164,098	313,009
Imports	58,313	74,356	193,018
Exports (less)	32,301	39,927	76,938
Total	217,179	198,527	429,089

Source: Official statistics, industrial statistics 1980-81, Foreign Trade 1980-81, trade estimates, and U.S. Foreign Commercial Service report, "Telecommunications Equipment—Norway".

Competitive Environment

Extensive cooperation among the Nordic countries, particularly in the areas of mobile radio and satellite communications, has enabled Danish and Swedish manufacturers of telecommunications equipment to achieve especially strong positions in the Norwegian market. German companies are important suppliers of telephone, telex, and transmission equipment, while Japanese firms are major sources of mobile radios and video and radio broadcasting equipment. Domestic production of telecommunications equipment focuses on telephone sets, exchanges, switching equipment, and transmission equipment, especially cables.

Telephone and telex equipment.—The Norwegian market for telephone and telex equipment is forecast to approach $230 million in 1987, more than double its 1981 level of $103.5 million. This upsurge is expected to result from the emphasis placed by NTA on expanding the country's telephone service, including the introduction of a digital switching system. Despite the virtual monopoly that two domestic firms—Elektrisk Bureau A/S (EB) and Standard Telefon og Kabelfabrikk A/S (STK)—have enjoyed in the telephone exchange and switching systems market, foreign companies are considered likely to play a much larger role in the near future. Thus imports, which accounted for 14 percent of sales (nearly $15 million) in 1981, are predicted to total 32 percent (almost $75 million) in 1987.

EB, which holds about 70 percent of the public-sector market for switching equipment, is 25-percent owned by L.M. Ericsson (Sweden). The firm has introduced Ericsson's AXB data switch in Norway and expects to offer a modified version for the new digital switching system. In 1981, EB supplied 30,000 pushbutton telephones for trial by NTA. The telephones have interconnect and programing

Source: U.S. Department of Commerce, Foreign Commercial Service, American Embassy Oslo report "Telecommunications Equipment—Norway," November 1982, and desk research.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=5.74 1981, and subsequent years. Values given in 1980 constant dollars.

capabilities, which can be exploited with the expansion of the country's digital networks. EB is also developing a private automatic branch exchange (PABX) that can handle both voice and data.

STK, a subsidiary of International Telephone & Telegraph (ITT), is a major supplier of both electromechanical and semielectronic computer-controlled exchanges. The firm is also an important producer of PABX equipment with up to 1,600-line capability. It has supplied roughly 50 percent of the country's telephone exchanges.

In 1981, German firms accounted for nearly 17 percent of telephone and telex equipment imports. Siemens dominates the market for telex equipment, having reportedly supplied more than 80 percent of the installations in Norway.

U.S. suppliers of telephone and telex equipment are expected to see their share of the import market leap from 2 percent ($1 million) in 1981 to 20 percent (nearly $15 million) in 1987. Industry experts predict a demand for encrypters (scramblers), and several types of services planned by NTA may spur sales of tele- and video-conferencing equipment facsimile machines.

Transmission equipment.—Sales of transmission equipment are expected to nearly treble between 1981 and 1987, growing from $26 million to almost $73 million. Microwave links, which are in extensive use because of the geography of the country, show good sales prospects, with demand focusing on short/intermediate/long-haul digital equipment. Market opportunities should also exist for laser fiber optics and pulse-code modulation (PCM) multiplexers. The offshore oil industry is interested in ultrahigh frequency (uhf), very high frequency (vhf), and microwave digital radio link equipment.

Domestic companies should continue to dominate the market, accounting for 80 percent of all sales. STK makes a complete range of telecommunications cables and has begun to manufacture fiber-optic cables. The company also produces PCM multiplex and line equipment. EB is a major supplier of microwave systems, high frequency (hf) radio stations, and—through its subsidiary Norsk Kabelfabrikk A/S (NK)—a variety of cables. NK reportedly supplies 40 percent of all telecommunications cable purchased by NTA and is an important source of fiber-optic cables for the offshore oil industry. Nevertheless, purchases of advanced U.S.-made transmission equipment are expected to escalate from $527,000 (10 percent of imports) in 1981 to $3.5 million (25 percent of imports) in 1987.

Table 2.—Norway: Imports of telecommunications equipment by country of origin, 1981 and projected 1987

	1981	Projected 1987
Telephone and telex equipment		
United States	1,178	14,925
Denmark	17,872	7,462
Sweden	17,646	22,239
Germany	8,421	11,194
Other	6,288	18,806
Total	51,405	74,626
Transmission equipment		
United States	527	3,475
Germany	2,339	4,170
Finland	376	1,111
Other	2,015	5,144
Total	5,257	13,900
Mobile radio		
United States	1,903	4,723
Sweden	4,994	6,301
Denmark	4,593	5,353
Japan	2,670	9,447
Germany	1,942	3,149
Other	2,776	2,519
Total	18,878	31,492
Video and radio broadcasting equipment		
United States	3,801	13,200
Japan	5,975	13,200
Germany	5,628	8,800
Sweden	3,304	4,400
Other	4,201	4,400
Total	22,909	44,000
Data communications equipment		
United States	6,937	14,480
Finland	2,081	2,320
Japan	1,907	5,800
Germany	1,558	2,030
Sweden	1,387	1,450
United Kingdom	3,173	2,900
Other	302	20
Total	17,345	29,000

Source: U.S. Foreign Commercial Service report, "Telecommunications Equipment—Norway."

Mobile radio.—The market for mobile radios is projected to exceed $55 million in 1987, up from $35 million in 1981, stimulated by government plans to increase subscribers to the new automatic mobile radio telephone system inaugurated in 1981. Scheduled introduction in late 1984 of a public paging network is foreseen as a market source also. Trade sources expect demand to focus also on public mobile telephones for private aircraft and air-ground communications systems for helicopters.

During the 1981-87 period, foreign firms are expected to strengthen their position at the expense of domestic companies (notably Simonsen Radio), whose share is predicted to decline from 47 percent to 43 percent. Of the $18.5 million worth of mobile radio equipment imported in 1981, purchases of

U.S.-made products were close to $2 million; imports are projected to reach $31.5 million in 1987, with U.S. companies accounting for nearly $5 million. U.S. manufacturers are likely to benefit from increased use of air-ground systems by the large helicopters operating in the North Sea area. The major supplier is Motorola Communications, the only U.S. company that has met NTA's stringent technical specifications for mobile telephone equipment.

Japanese producers are expected to enjoy a spectacular rise in sales, from $2.6 million in 1981 to $9.5 million in 1987, which will put them in a dominant position. The market leaders include Mitsubishi, Matsushita/Panasonic, and NEC. Significant sales have also been made by Salora (Finland), AP and Storno (Denmark), SRA/Sonab (Sweden), and Siemens. NTA has approved all these firms as well.

Video and radio broadcasting equipment.—Sales of video and radio broadcasting equipment are expected to double from $15.5 million in 1981 to nearly $32 million in 1987, owing in part to the Government's decision to allow local private broadcasting. Plans to replace old vhf transmitters should create sales opportunities, and demand is expected also for closed circuit TV (CCTV) equipment, FM transmitters in the 1-5 kw range, antennas, and radio and video studio equipment.

Imports account for virtually all the broadcasting equipment market. U.S. companies, which had sales of almost $4 million in 1981, should see their share more than treble to $13 million in 1987. Participating firms include MCI, Mosley, and Grass Valley, which have recently increased their sales of video mixers, remote controls, and multitrack equipment.

American suppliers face considerable competition from Japanese firms, however, and to a secondary degree, from German producers. Suppliers from these two countries are expected to maintain their shared 50 percent of the import market through 1987, even with increased U.S. contributions. Nippon (Japan) has provided transmitters in the 5-10 kW range and vhf transmitters. The principal German companies active in this market include Telefunken, which supplied the 1,200-kW Kvitesoy AM transmitter (among the largest in Europe), and Rhode & Swartz and Kaphrein, which supply antennas to NTA. Teleste (Finland) is the main supplier of parabolic antennas.

Data communications equipment.—Government plans to increase the number of subscribers to the new Public Data Network are likely to boost sales of data communications equipment from $17 million in 1981 to $39.5 million by 1987. According to trade experts, demand will focus on switching equipment, line drivers, multiplexers, and terminals. An excellent market is anticipated, particularly in the near term, for modems in the 1,200-2,400 bits per second (bps) range.

Domestic companies are important producers of data modems. STK makes modems up to 19.2 kbps, and EB is developing both a high-speed modem and a single-fiber, full-duplex data link. Because these firms export much of their output, however, they account for only about 25 percent of the Norwegian market.

U.S. manfacturers dominate the import market, accounting for almost $7 million of the $17 million import sales in 1981; they are expected to capture half of the $29 million in sales projected for 1987. Major suppliers include ITT, Codex, and Racal-Milgo, which supply high-speed modems. Other foreign suppliers include Nokia (Finland), which provides 1,200-2,400 bps modems, and Ericsson, which sells modems in the medium-speed (4,800 bps) range.

Communications test and measurement equipment.—Sales of communications test and measurement equipment stand at about $10 million annually. U.S. companies, the major suppliers of such equipment, are likely to find the greatest demand centered on microwave sweep generators, telegraph signal test sets, transient recorders, interface testers, PCM system analyzers, fiber-optic measurement equipment, and dedicated automatic test equipment.

Satellite transmission equipment.—In addition to the NORSAT system, which links North Sea offshore oil/gas installations with each other and the mainland, the Government is involved in the MARISAT and INMARSAT satellite systems. Current demand for satellite space on the part of private companies could prompt the initiation of other satellite communications projects, thus stimulating the market, especially for earth stations. Three offshore oil platforms are reportedly due to receive antennas and earth stations.

Most of the equipment for a recently constructed earth station, said to be the first in Europe connected to the INMARSAT system, was supplied by EB. However, recent contracts for earth stations have been awarded to the Japanese suppliers Fujitsu/Mitsubishi as well as to EB. Antennas and other equipment made by the U.S. firms Comtech, E-Systems, and Radiation Systems have been incorporated in the earth stations supplied by the Norwegian firm.

End-User Profiles

Telecommunications Administration.—NTA is the government-owned public utility charged with the management and operation of all telephone, telegraph, telex, broadcast, and other communications services. All private telephone companies in Norway were absorbed before 1977 by NTA, whose responsibilities also include conducting telecommunications research and development and implementing new services in response to demand. Norwegian Government representatives cite social, cultural, and economic incentives for maintaining political control of the telecommunications industry. NTA's organizational structure comprises a headquarters office, six regional administrations, and 28 local telecommunications areas.

Approximately 90 percent of NTA's revenue is generated by telephone traffic. By the end of 1981, a total of 1.99 million telephones were installed in Norwegian homes, reaching 60 percent of all households (see table 3). Average telephone density was 45.2 telephones per 100 inhabitants. More thn 98 percent of telephones in use were connected to automatic exchanges, and NTA expects full automation by 1985. NTA provides all subscriber equipment on a monopoly basis, with the exception of certain type-approved private equipment. As part of its expansion program, NTA seeks to increase the number of telephone subscribers from 1.2 million to 2.3 million by 1993.

The Norwegian telex service, which has been fully automatic since 1967, has seven switching stations, three of them computerized. At the end of 1981, the system, which has a capacity of 12,000 subscribers, had 7,925 subscribers and no waiting list. Telex activity in 1981 totaled 30.7 million minutes, more than half in overseas traffic. NTA introduced facsimile in September 1981, and by the end of the year the system had 234 subscribers and had handled 5,314 messages.

A public manual mobile telephone network established by the Nordic countries in 1966 has nearly 90,000 subscribers, 32,000 in Norway. In 1981, NTA introduced a new automatic mobile radio telephone service that operates on a cellular basis. The system, which will probably replace the manual service by 1990, has 180 duplex channels, each 2x25 kHz, allocated to it on the uhf band. Duplex separation is 10 MHz. The power level is 1.5-15 W from the mobile radios and 50 W from the base stations. A binary 1,200-baud signaling with FFSK modulation is used for data transfer. Subscribers provide their own moblie telephone sets, which must be approved by NTA before connection to the network.

NTA plans to convert the maritime mobile telephone service to this automated system, enabling the nation's entire coastline to be covered. It is encouraging current subscribers to switch to the automatic system, which is expected to have 80,000 Norwegian subscribers by 1987.

The public paging network that NTA will establish in 1984 will have one exchange, 10 regional control units, and about 80 transmitters to serve approximately 60 percent of the population. NTA may compete with private vendors in supplying paging receivers.

Table 3.—Norway: National telecommunications network, 1981

(all figures in units of equipment or U.S. dollars)

Population	4 million
GNP	$58.6 billion
No. of telephones	
Business/residential	1,992,000
Mainstations	1,268,213
Mainstation waiting list	5,793
No. of key systems	
2-10/4-10 lines	20,000
No. of PBX's	
Analog	12,600
Digital	6 — expects 450 by 1987
No. of main lines	122,000
No. of exchanges	
Local	
Manual/electromechanical	150
Analog electronic	2,800
Digital electronic	Under development
Toll	
Manual/electromechanical	NA
Analog electronic	NA
Digital electronic	NA
International	
Manual/electromechanical	NA
Analog electronic	1
Digital electronic	NA
No. of telephone calls	
Local	4.3 billion
Toll	NA
International	310 million
Completion rate	
Local	90 percent
Toll	NA
International	94 percent
No. of telex subscriber lines/switches	8,100
Waiting list for lines	None
Minutes logged	50 million
Domestic	14.2 million
International	16.5 million
No. of dedicated lines for datacom	12,500
PTT:	
Total employees (telecommunications only)	18,926
Total revenues	$776 million
Value of capital equipment purchased 1981	$226 million
Total budget	
Construction budget	$122 million
Operating budget	$378 million

Source: Norwegian Telecommunications Administration.

NTA is extending the public data network, now based on circuit-switchig techniques, by introducing packet-switching techniques. The first stage of the network, completed in 1981, handles about 2,000 terminals. The second stage will be handling 10,000 terminals by 1986. NTA plans call for incorporating a teletext system in the network in 1983. The Norwegian telecommunications network permits data transmission by telex, telegraph (50 baud), and telephone (300-3,400 cycles). The public telephone networks transmit data at speeds of 200, 600, 1,200, and 2,400 bps. In addition to controlling all data transmission across common carriers, NTA provides all connections and modems.

Because of the technical constraints on data transmission via the public telephone network, NTA offers point-to-point subscriber circuits with a maximum transmission speed of 9,600 bps. In addition, 60 point-to-point overseas circuits were operating in 1980. Access to databases in the Nordic countries and the United States has been available through the data network since early 1981, and full international access was expected as of late 1982. NTA plans to offer 1,200 and 48,000 bps transmission (wide-band) speeds for its circuits.

NTA put the number of data communications subscribers at 11,000 in 1981 and expects to have about 27,000 by the end of 1987. It also anticipates an increase in the number of modem subscribers from the current 12,000 to approximately 22,000 in 1987.

Broadcasting.—The Norwegian Broadcasting Corporation (NRK), the State broadcasting authority, answers to NTA. Until recently, it was responsible for virtually all purchases of video and radio broadcast equipment. Government approval of local private broadcasting, however, has brought a proliferation of new radio broadcast studios and CCTV companies, which now total some 50 to 60 private organizations. Equipment purchases by these private broadcast companies, which can be significant, are nevertheless subject to NTA control and approval.

NRK and NTA are replacing old vhf transmitters at a planned rate of 10 per year. NTA now controls 44 vhf transmitters and recently ordered a uhf transmitter.

Transportation.—The Norwegian railway system (NSB) uses fiber-optic cables in its railway network and as part of its video monitoring system at the Oslo railway station. NSB also operates a data communications network (not controlled by NTA) using simplex, half-duplex, and duplex operations.

Offshore oil industry.—Four major offshore telecommunications systems are in operation in the Norwegian sector of the North Sea. All the systems are based on satellite communications. The $30 million Ekofisk system, for instance, uses microwave and satellite relay, ship-to-shore radio, and tropospheric links to connect the central platform with neighboring production platforms, pipeline pumping stations, terminal facilities in the United Kingdom, and company headquarters in Norway.

Marketing Practices

For a variety of reasons, including protectionist policies, the United States is not a major supplier. Although these policies are being relaxed somewhat, NTA approval is still required for all subscriber equipment to be connected to NTA's circuits and for most telecommunications products sold in Norway. Technical requirements remain stringent. Government approval of telecommunications equipment is generally based on compliance with the European CEPT (Conference Europeenne des Administrations des Postes et Telecommunications).

Foreign suppliers will have an opportunity to show their products at the communications exposition planned for May 1983 in Oslo. The exposition, the first of its kind in the country, will feature telephone, mobile radio, data communications, broadcasting, and satellite equipment.

Norway: Basic Economic Indicators

Population:	4.1 million (1982)	Major trading partners:	United Kingdom, West Germany, Denmark, Sweden, United States, Eastern Bloc countries
Area:	323,750 sq. km.		
Administrative units:	19 counties, 2 territories, 404 communes, 47 towns		
GNP:	$50.1 billion (1982)	Exchange rate:	6.54 kroner=US$1 (1982)
Contributions to GDP:	Services 54%	Fiscal year:	Calendar year
	Industry 41%	Current account balance:	+$2,567 million (1981)
	Agriculture 5%	International reserves:	$5,904 million (1981)
Per capita income:	$12,560 (1981)	Federal budget	
Inflation rate:	11.3% (1982)	revenues:	$15.0 billion (1980)
Exports f.o.b.:	$18,708 million (1981)	expenditures:	$18.7 billion (1980)
U.S. share:	3.8% (1981)	Labor force:	1.9 million (1982)
Imports c.i.f.:	$16,301 million (1981)	Unemployment:	2.3% (1982)
U.S. share:	9.2% (1981)	Average hourly wage:	$10.49 (1981)

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Commercial Section
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Royal Norwegian Embassy
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tf: 333-6000

Telecommunications administration:

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tf: 11 90 90
tg: 17498 sdepn

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Radio/television broadcasting:

Norsk Rikskringkasting (NRK)
Bjornstjerne Bjornsons plass 1
N-Oslo 3
Attn: Director General
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tx: 16820 nrutl n (for radio)
11794 nrtvp n (for tv)

Technical standards:

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Country Market Survey

Computers and Peripheral Equipment

Denmark

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ternational Trade Administration

From just $83 million[1] in 1975, the Danish market for computers and related equipment grew to $267 million in 1981 (see table 1). As Denmark's economy struggles out of a recession that has cut into the Danes' high living standard, industry analysts predict 20 percent per annum average growth through 1986. Computer sales are projected to reach $664 million that year. Growth is likely to be fueled by the trend toward distributed data processing and the computerization of Danish offices, both promising to put more computing power in the hands of individual users. U.S. brands dominate the market, capturing 75-85 percent of sales, though much of this equipment is shipped from third-country factories. In 1981, U.S.-source imports amounted to $90 million, or one-third of purchases from abroad. Shipments from American plants are forecast to approach the quarter billion dollar mark by 1986.

Moderate expansion is anticipated in the market for mainframes. The installed base of what local analysts call major computers (large mainframes) is expected to grow from 600 units in 1981 to more than 1,000 in 1986 (see table 2). Most of the big machines are found in the public sector and the financial industry. Many of the large centralized Government organizations handling recordkeeping and administration of Denmark's cradle-to-grave welfare system need replacements for some older equipment. Demand is also expected to comprise new installations and equipment to upgrade current systems.

Trade sources foresee a more dramatic hike in sales of small mainframes and minicomputers, called small and medium computers in Denmark. Decentralization of many data processing functions is expected to mean strong demand for such equipment, and the installed base of smaller computers is forecast to more than triple, from 10,300 to nearly 38,000 over the 1981-86 period.

Danish computer users are sufficiently sophisticated to buy a substantial and growing volume of separately sold peripherals. In particular, the proliferation of computer networks over the next few years should help boost sales of plug-compatible terminals and other related peripherals. The population of terminals is projected to grow from about 38,500 in 1981 to nearly 94,000 in 1986. In agriculture, for example, Denmark's 100,000 farmers have set up their own EDP center. Every farmer will eventually be able to hook a terminal to the system's central mainframe to carry out feed and pricing analyses.

Table 1.—Denmark: The market[1] for computers and peripheral equipment, 1980, 1981, and 1986

(in millions of U.S. dollars)

	1980	1981	1986
Production	55.5	60.2	121.1
Imports	216.5	266.6	663.4
Exports[2]	36.1	60.0	120.6
Market size	235.9	266.8	663.9

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Includes some re-export of equipment previously imported.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Denmark" (see Additional Information box). Figures in this report are based on data gathered in Denmark, including available government statistics, industry reports, and trade source estimates and projections.

Government.—The public sector, which comprises Government operations, utilities, and education, accounts for over half of all computer purchases. Denmark's administration has employed computer techniques since the late 1950's, and it continues to provide a major source of demand. Most of the Central Government's data processing needs are covered by I/S Datacentralen, a publicly-owned service bureau that handles such large-scale jobs as the income tax system, the value added tax, the census, customs administration, the central motor vehicle register, and Government employee salaries. Trade sources note good sales potential for IBM-compatible mainframes and peripherals to supplement Datacentralen's IBM, Amdahl, and CDC equipment.

Data processing for county and municipal government is carried out by I/S Kommunedata, which is owned by city administrations to serve welfare and social programs, as well as the needs of hospitals and other health care institutions. Kommunedata is said to be considering replacement of some of its old IBM hardware, and sales prospects are also good for decentralized processing and office automation equipment. This service bureau hopes to install intelligent terminals in all municipal department offices by 1990. As private (though publicly held) corporations, both Datacentralen and Kommunedata are exempt from the EDP procurement regulations that control acquisition of computers by other public agencies. Purchase decisions for these companies are made by their own management.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=5.65 krone (1980) and 7.12 krone (1981 and subsequent years). Values through 1981 are expressed in current rather than constant dollars/prices; values for 1982 and subsequent years are expressed in 1981 constant dollars/prices.

Users of technical application systems within the public sector include the state railways, the post and telegraph authority, defense, the motor highway directorate, hospitals, laboratories, the telephone system, and electric power utilities. In education and research, three regional computer centers, located at Copenhagen, Arhus, and Technical Universities, account for about 75 percent of central processing unit (CPU) capacity. Because of budget cutbacks, potential in this sector is limited to replacement of old equipment.

Banking and finance.—Denmark's 79 commercial and 168 savings banks are long-time computer users. The Association of Savings Banks pioneered Scandinavian use of EDP techniques in banking, and most of its members now employ on-line equipment. The Association also operates a large computer center in the Copenhagen area. A leading user, Sparekassen SDS, is currently considering upgrading its terminals. Among commercial banks, all the large and medium sized banks, as well as some of the smaller companies, operate their own modern computer centers, with on-line terminals in every branch. Other important buyers of computers and related equipment in the financial industry include three large mortgage institutions, the Danish National Bank, the Postal Bank, and five of the biggest pension funds.

Insurance.—The insurance business is dominated by about 50 Danish companies, 7 of which employ more than 1,000 persons. All of the leading underwriters have their own large-scale computer installations, and most of them plan to install on-line facilities at branch offices throughout Denmark. Trade sources foresee excellent demand for intelligent terminals, printers, and minicomputers in this sector.

EDP service bureaus.—Most of Denmark's 400 or so EDP service bureaus are small; only 25 have more than 50 employees. Many small operations are expected to be forced out of business as their traditional clients increasingly turn to personal and microcomputers for accounting, payroll, and management applications.

Manufacturing. — In manufacturing, which accounts for 22 percent of Danish gross domestic product (GDP), more than 75 percent of computing capacity is used for administrative purposes such as office routines, wages, sales and invoicing, inventory control, budgeting, and planning. Anticipated growth potential results from a move toward office automation, as well as from market expansion as smaller manufacturing firms bring functions traditionally handled by service bureaus in-house.

Major Market Trends

Business, commercial, and administrative applications account for most processing time on medium and large mainframes in Denmark, as well as for most minicomputer installations. Mini's are increasingly used in networks and for on-line processing at the point of transaction. Medium and large-scale systems remain popular for Government administrative statistical tasks and for educational and research EDP applications.

An official EDP Census planned for 1983 should provide more detailed information on the installation and use of various classes of computers. When completed, the study results will be available from the Danish EDP Council at the following address: EDB Radet, Bredgade 58, DK-1260 Copenhagen K. Based on currently available information, other trends in computer use are discussed below.

Distributed vs. centralized data processing. — Danish computer users are decentralizing more of their computing activities as communications technology allows faster, cheaper data transmission and as more workers and managers become adept at

Table 2.—Denmark: Number and value[1] of installed computers, by size,[2] 1980, 1981, 1986

	1980		1981		1986	
	Number of units	Value ($ millions)	Number of units	Value ($ millions)	Number of units	Value ($ millions)
Small and medium computers	7,918	303	10,262	355	37,623	782
Large computers	540	762	600	846	1,015	1,407
Terminals	32,238	264	38,474	291	93,664	480

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

[2] Computer size is based on CPU capacity, as follows: small and medium computers, capable of less than .5 million instructions per second large computers, capable of .5 million instructions per second or more.

Source: See source notation of table 1.

handling computers. Many first-time buyers are installing several minis or other small systems in lieu of a single large mainframe, and users who expand existing centralized systems often do so by adding small computers or terminals at remote sites. Both remote and central processing locations are then linked through a communications network.

Industry sources expect much of the growth in Danish computer use to come from the decentralization of processing power. In the retail and financial sectors, widely dispersed point-of-scale (POS) terminals with their own intelligence are connected to a central mainframe for on-line transaction processing. A local area network (LAN) developed by a Danish EDP firm, Christian Rovsing, aids the expansion of distributed processing in such diverse applications as office automation and industrial process control.

Data communications facilities.—Denmark's PTT, the postal and telegraph authority, offers modern, efficient data transmission with standards that correspond to those set by the International Telegraph and Telephone Consultative Committee (CCITT), the European Conference of Postal and Telecommunications Administration (CEPT), and the International Organization of Standardization (ISO). The PTT must approve modems used on the public network. The number of modems in use amounted to 16,000 at the end of 1981; by 1986 the number is projected to reach 37,000. Access to the Danish network ties users into such international data transmission systems as Euronet and the Nordic Public Data Network. Additional information on data transmission is available from the Post and Telegraph Authority, Teleregion 1, Rodovrevej 241, DK-2610, Rodovre.

Automated business transaction information systems.—Banks, insurance companies, and retail stores are all moving to automate many of their transactions with on-line equipment. A number of larger department stores and supermarkets have already installed POS systems that record sales and update inventory. Only the severe recession of the past few years has hampered even faster growth. Banks, too, have bought on-line terminals for transaction processing; several financial institutions are moving into the second generation of such equipment.

Software.—Trade sources note that Danish computer users develop much of their own software, particularly for business and government administration applications. The most popular programming languages are COBOL and PL/1, though other languages are often used extensively on selected hardware.

EDP personnel.—While the supply of trained computer personnel in Denmark is said to be adequate, observers point out that there is no unemployment among EDP professionals, despite the country's overall 10 percent jobless rate. Most computer education is provided at State expense in Denmark, though some private sector institutions also offer EDP training.

Equipment acquisition.—Most medium and large systems are leased, normally under 4-year contracts. The practice of single sourcing has begun to break down as Danish users gain experience. Many buyers now look to multiple vendors to put together a system that meets their needs.

Competitive Environment

Most of the computers and peripherals sold in Denmark are either imported or assembled from components and subassemblies built outside the country (see table 3 for imports in selected equipment categories). Imports, valued at $267 million in 1981, are forecast to expand at a 20 percent annual pace, topping $660 million in 1986. American brands, often shipped from plants in Germany and other European countries, account for about three-fourths of the market. The local industry is small but growing rapidly and enjoys the active support of the Danish Government.

U.S. suppliers.—American vendors, led by IBM, have been active in Denmark since the first EDP machines were installed. U.S.-brand equipment is recognized for its excellent performance, quality, and reliability. The good reputation won by American products is expected to help boost sales of U.S. built mainframes, mini's and peripherals some 22 percent per annum over the 1982-1986 period. IBM is said to supply some 50-70 percent of the market from both U.S. and European factories. The company is particularly strong with large systems for Central Government administrative applications; in 1980 over two-thirds of Datacentralen's equipment consisted of IBM machines. A number of these large users are diversifying, however, creating excellent sales potential for U.S. vendors of IBM–compatible mainframes and peripherals.

American competitors with their own sales subsidiaries in Denmark include Amdahl, Cincom, Control Data Corporation (CDC), Data General, Datapoint, Digital Equipment Corporation (DEC), Hewlett-Packard, IBM, ITT, Memorex, National Cash Register (NCR), Tektronix, and Texas Instruments. A number of other U.S.-based firms are represented by Danish companies. Among them are: Dynatech, Fairchild, Informatics, Lear-Siegler, Perkin-Elmer, and Wang.

Third-country suppliers. — Most third-country shipments come from overseas factories of American-

Table 3.—Denmark: Imports of selected categories of computers and peripheral equipment[1] *by country of origin, 1980, 1981, and 1986*

	1980		1981		1986	
	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)	Value ($ millions	Import market share (%)
Analog and hybrid (analog-digital) data processing machines						
United States	1.6	53	1.1	37	1.8	45
Germany	.8	27	—	—	—	—
Finland	.4	13	—	—	—	—
France	—	—	.3	10	—	—
Others	.2	7	1.6	53	2.2	55
Total	3.0	100	3.0	100	4.0	100
Complete digital data processing machines, with CPU, input unit, and output unit in a single cabinet						
United States	5.4	32	5.1	27	26.4	33
Germany	5.9	35	3.3	18	20.0	25
Italy	—	—	3.4	18	—	—
Ireland	2.7	16	3.2	17	20.0	25
Others	2.9	17	3.8	20	13.6	17
Total	16.9	100	18.8	100	80.0	100
Digital processors consisting of arithmetical, logical, and control elements						
United States	20.4	29	21.7	26	45.0	30
Germany	13.8	20	21.8	27	45.0	30
France	10.0	14	18.4	22	30.0	20
United Kingdom	13.8	20	5.9	7	7.5	5
Others	12.5	17	14.5	18	22.5	15
Total	70.5	100	82.3	100	150.0	100
Digital central (main) storage units sold separately						
United States	2.1	9	.6	4	2.3	5
Germany	—	—	9.2	70	32.4	70
United Kingdom	15.5	63	2.2	17	9.3	20
Italy	4.1	17	—	—	—	—
Others	2.8	11	1.2	9	2.3	5
Total	24.5	100	13.2	100	46.3	100
Peripheral units, including input, output, control and add-on storage units sold separately						
United States	33.1	34	58.4	40	167	45
United Kingdom	11.1	12	27.6	19	70	19
Germany	14.9	16	16.7	12	22	6
Sweden	14.9	16	12.7	9	39	10
Japan	—	—	6.8	5	36	10
Others	22.1	22	21.9	15	41	10
Total	96.1	100	144.1	100	375	100
Keyboard, verification, and calculation equipment sold separately						
United States	.2	50	.1	50	.05	50
Others	.2	50	.1	50	.05	50
Total	.4	100	.2	100	.10	100

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[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

Source: See source notation of table 1.

owned multinationals. For example, both IBM and Amdahl supply the Danish market from factories in neighboring Germany, helping explain the 20 percent of Danish computer imports coming from Germany in 1981. Japanese manufacturers have thus far made only limited inroads in the Danish market, but trade sources expect them to make a stronger showing by 1986, especially with printers and terminals.

Domestic manufacturers.—Denmark's own computer was valued at $60.2 million in 1981 and is projected to top $121 million in 1986. Three firms with a strong microcomputer orientation dominate the industry, accounting for over 80 percent of Danish production.

The largest, Christian Rovsing, employs 700 people and boasted a 1980 turnover of $21 million. Originally established as a software house in 1963, the locally owned company has expanded into network design, space and defense projects, data processing services, and computer production. Trade sources describe the company's computer, the CR80, as a highly reliable, secure, and sophisticated multiprocessor system capable of linking up to 80 microcomputers. Rovsing also sells a local area network, dubbed X-NET, which is based on a single pair of shielded cables and offers a 1.8 million bit per second (bps) transfer rate.

Regnecentralen, Denmark's oldest computer business, is both a distributor and manufacturer. The firm's production arm employs about 400 people to build the RC 8000 computer. Customers have included Michigan Bell Telephone and Lockheed, which bought complete telephone data information systems developed by Regnecentralen in 1979.

Established in 1975, Dansk Data Elektronik (DDE) produces a modularly constructed microcomputer for professional applications, the SPC/1. DDE employs 55 people and reported 1981 sales of about $5 million. Some 15 percent of production is exported. The firm predicts an annual production increase of about 30 percent per annum over the next 5 years.

As a full member of the European Common Market (EEC), Denmark imposes no tariffs on EEC-built computers and applies the common EEC external tariff to U.S.- and Japanese-built hardware. However, the Danish Government is said to be strongly committed to building a domestic "informatics" industry, and is currently subsidizing research and development in computer technology to the tune of $6.5 million a year, or $26 million over the 1983-86 period.

Additional Information

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The Survey summarizes a 27-page International Market Research (IMR) report prepared by the U.S. Foreign Commercial Service in Copenhagen and reflects the opinions and views of interviewees in Denmark. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as specific recommendations for new-to-market firms.

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Denmark's multiple providers of telecommunications services expect to increase their equipment purchases from $187.4 million in 1981 to over $254 million in 1985 (see table 1). The country's telecommunications network is now developing into an integrated information service network, made possible by the emergence of microelectronics, laser techniques, and optical fiber transmission. Its high level of integration into the Nordic and European networks is reflected in the dominant presence of Swedish and other neighboring suppliers in the import market.

Table 1.—Denmark: The market for telecommunications equipment, 1980-81 and projected 1985

(in millions of U.S. dollars)

	1980	1981	Projected 1985
Telegraph and telephone equipment (including wire transmission equipment)			
Local production	72.5	70.8	86.1
Imports	82.0	63.9	77.6
Exports (less)	25.7	33.5	40.7
Total	128.8	101.2	123.0
Radio communications and broadcasting transmitters and transmitter/receivers			
Local production	73.0	81.2	96.2
Imports	10.3	15.6	30.6
Exports (less)	50.5	57.8	65.8
Total	32.8	39.0	61.0
TV cameras, navaids, radar apparatus, and radio remote control apparatus			
Local production	2.1	3.2	3.9
Imports	11.5	16.4	19.9
Exports (less)	5.4	9.4	11.4
Total	8.2	10.2	12.4
Insulated wire and cable (for telecommunications use only)			
Local production	21.4	20.9	38.0
Imports	14.8	20.4	30.0
Exports (less)	5.7	4.3	10.0
Total	30.5	37.0	58.0
Total market			
Local production	169.0	176.1	224.2
Imports	118.6	116.3	158.1
Exports (less)	87.3	105.0	127.9
Total	200.3	187.4	254.4

Source: U.S. Foreign Commercial Service Report—"Market Brief on Telecommunications Equipment, Denmark."

Competitive Environment

With more than 62 percent of all purchases foreign-made, imports are predicted to climb from $116.3 million in 1981 to $158 million in 1985 In turn, almost 60 percent of Denmark's locally made communications equipment is destined fo export, with less than 1 percent of that going to the United States.

Swedish manufacturers provided more than 30 percent of Denmark's imports in 1981, and firms such as L. M. Ericsson consider Denmark almost as part of their home market. Siemens and othe German companies rank as major foreign suppliers sending 22.5 percent of Danish imports in 1981, Japanese vendors, with 9.5 percent of 1981 foreign purchases, also serve as important sources. The Danish telecommunications authority and the telephone companies have long-established ties with many of these suppliers, giving them a definitive edge over newcomers who must rely on significant produc development or pricing changes to break into the market.

Denmark's own telecommunications equipmen manufacturers chalked up 1981 sales of $176.1 million and are expected to increase 1985 production to over $224 million, with strong growth forecast for sales of optical fiber transmission systems marine-land instruments, and mobile communications equipment. With backing from the Posts and Telegraphs Administration (P&T), exports are seen as climbing from $105 million to almost $128 million in the 1981-85 period. The Government pays 45 percent of the costs if three or more companies join together to participate in foreign exhibitions or advertising and, in addition, makes export credits and guarantees available to telecommunications firms as well as other industries. Danish consortiums trying to sell to foreign communications authorities may also hire experts on a temporary basis from the P&T, reducing their own overhead and emphasizing their credibility.

Five of the 11 major local manufacturers have foreign ownership. Storno A/S (2,500 employees); belongs to General Electric (United States); Standard Electric Kirk (1,400 employees) is owned by ITT

Note: All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1=7.12 Danish kroner. Values for 1981 and subsequent years are given in 1981 constant dollars.

Source: U.S. Department of Commerce, Foreign Commercial Service, Copenhagen, Report—"Market Brief on Telecommunications Equipment, Denmark" (November 1982); "Telecom Control is Regional in Denmark," by Charles E. White and Simon Grant, **Telecommunications Magazine**, Volume 16, No. 5, May 1982 (by special permission of the publisher, Horizon House—Microwave, Inc., Dedham, Massachusetts); and desk research.

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Telephone and telex equipment		
GNT Automatic A/S	Denmark	Pay phones, electronic pushbutton phones, digital key systems
NKT	Denmark	Fiber optic cable
Standard Electric Kirk	Denmark	Digital exchanges, PABX's, telephone sets
Storno A/S	Denmark	Telecommunications equipment
L. M. Ericsson	Sweden	AKE large telephone exchange equipment, digital exchanges, telephone sets
Felten & Guilleaume Carlswerk A/G	Germany	Fiber optic cable
Philips	Netherlands	Fiber optic cable
Siemens	Germany	ESK small telephone exchange equipment, telex exchanges
Mobile radio		
A. P. Radiotelefon A/S	Denmark	Fixed, mobile, and portable VHF and UHF radio telephone equipment
Dansk Radio	Denmark	Marine radios, radio telephones, radar navigation equipment
Data communications equipment		
Christian Rovsing A/S	Denmark	Data communications equipment
Other telecommunications equipment		
Dansk Radio	Denmark	Satellite receiving stations
Elmi A/S	Denmark	Test equipment, telephone charge analysis equipment, traffic recorders, switching signaling systems
RE Instruments A/S	Denmark	CATV terminal equipment, radio instruments test and measurement equipment
Stofa A/S	Denmark	CATV aerials
AEG-Telefunken	Germany	Radio/TV transmitters and receivers

(United States); Dansk Signal Industri A/S (240 employees) operates as a wholly owned subsidiary of L. M. Ericsson; A. P. Radiotelefon A/S (170 employees) is part of Philips N.V. (Netherlands); and Stofa A/S (100 employees) is half owned by Cox Cable (United States) and half by Danish stockholders. Two of the major domestic manufacturers are 100 percent locally owned—NKT (3,000 employees) and GNT Automatic A/S (1,000 employees).

Shipments from U.S. suppliers amounted to $8.2 million in 1981, slightly over 7 percent of total mports. In 1985, U.S. firms' sales are forecast to reach $10 million, or almost 8 percent of imports. Although not claiming a major share of foreign purchases, American products do have a strong presence in the Danish market, mainly through the Standard Electric Kirk, Storno, and Stofa companies. The best prospects for U.S.-made equipment include:

- Office automation and electronic mail systems equipment
- Satellite TV transmission equipment
- Speech recognition, analysis, and synthesizer equipment
- Satellite navigation equipment

Good prospects also exist for licensing of advanced U.S. technology, especially in the data transmission field.

Product Market Profiles

Telephone, telex, and transmission equipment.—Steady growth is anticipated for the telephone, telex, and transmission equipment markets, with particularly bright prospects for digital exchanges, as several telephone companies have made policy decisions to switch over completely to digital equipment. The Copenhagen Telephone Company's (KTAS) plans call for all exchanges to be digital by the end of 1984. L. M. Ericsson has supplied its AKE equipment for large exchanges, and Siemens has provided ESK equipment for small exchanges. The Jutland Telephone Company (JTAS) decided to convert to a digital exchange system from 1983 onward. L. M. Ericsson and Standard Electric Kirk delivered the first digital exchanges to JTAS in late 1980. A few semiautomatic exchanges serve about 4 percent of Danish subscribers in the Copenhagen area and about 5 percent of the subscribers in the Faeroe Islands, but all other telephone users, including those in Greenland, are connected to automatic exchanges.

The local telephone companies supply most subscriber equipment, including telephone sets and PABX's, but allow hookups of special equipment. Both the P&T and the telephone companies permit the use of privately owned PBX's upon approval. The supplier of approved special equipment is required to give the user clear instructions in Danish for connection and use of the equipment and must indicate where in Denmark the equipment can be repaired if necessary. Standard Electric Kirk claims about 70 percent of Denmark's PABX market and also manufactures telephone sets. GNT Automatic A/S is known worldwide for its pay phones and is developing a reputation for sleek electronic push-button phones.

The P&T, the telephone companies, and private suppliers all offer telefax service, although demand is not significant. The telecommunications administrations issue a directory of telefax subscribers; telephone subscribers with privately purchased facsimile equipment may also be included in the directory for a fee if their equipment conforms to CCITT recommendations for group 2 equipment. No electronic mail service is offered, since Denmark's small size almost ensures overnight delivery of regular mail. The P&T is, however, moving toward establishment of an international electronic message system.

The use of telex is predicted to grow steadily from 15,000 subscribers in 1980 to 30,000 subscribers in 1990. Telex service is now available throughout the country on a completely modernized system based on two large Siemens TWKD2 transit and international exchanges and about 30 Siemens TWK10 terminal exchanges. Equipment is provided either by the P&T or by private suppliers, but telex-PABX's must conform to the P&T's requirements for call procedure, character repertoire, and buffer storage capability. In addition, a "fonotelex" service unique to Denmark offers telex usage to customers without telex who dictate messages by telephone to the P&T for onward transmission by telex. The telex market is expected to expand still further when the P&T introduces a teletex service in 1984.

Danes are showing increasing interest in sophisticated transmission equipment, particularly fiber optics. The Jutland Telephone Company, which has already installed some optical fiber cables, plans to expand its optical fiber network by 700 kilometers by 1987. JTAS has also installed AEG-Telefunken's (Germany) optical transmitting and receiving units for digital transmission of television and radio programs in northern Denmark. The system, believed to be the first of its kind in Europe, allows several thousand subscribers to receive as many as 8 TV, 6 stereo radio, and 12 monaural radio channels from a local central receiving station. Telefunken's high-power CWL 2500 laser, which can be used for rates of more than one gigabit/second, functions as the core of the transmitting unit.

NKT, Philips, and Felten & Guilleaume Carlswerk A/G (Germany) have already supplied the Copenhagen Telephone Company with fiber optic cable. NKT, which has a long history as a cable producer, expects a widely expanding market in fiber optics, with conversion of trunk lines and data networks to this type of cable. GNT Automatic is moving into the field of digital transmission with its Polygon 128 Key System, which digitizes voice communications within the local area but translates the digital signal back to analog for communication over the telephone network. Stofa A/S, with its nationwide branches, serves as a principal designer and installer of communal aerials.

Mobile radio.—Several recently inaugurated P&T services are fueling the market for mobile radio equipment, including the planned introduction in mid-1983 of a public paging system. Another radio paging service handled by a private firm already exists in the 400-MHz range.

In January 1982, the P&T jointly put into operation with Finland, Norway, and Sweden a common Nordic automobile mobile telephone system (NMT), which at the end of 1982 had almost 14,000 subscribers in the manual service and 6,500 subscribers in the automatic service. Subscribers purchase the radio equipment themselves, with type approval by the P&T.

Maritime services are also operated by the P&T with radio connections between stations in ships and on land for the transmission of telephone calls, telegrams, and telex messages. These services are carried out by five Danish coast radio stations.

Dansk Radio ranks as an important supplier of marine radios and also manufactures radio telephones and radar navigation equipment. The company recently provided the point-to-point communications system linking Denmark's embassies around the world. A. P. Radiotelefon A/S manufactures fixed, mobile, and portable VHF and UHF radio telephone equipment.

Data communications equipment.—Data transmission services available in Denmark include the Datel service using the public telephone network and leased circuits, data transmission over the telex system, and the Datex public data network. The P&T exercised monopoly powers over data transmission until 1980 when it transferred control over low-speed modems (up to 300 bps) to the individual telephone companies. Today the P&T allows private circuits but does not encourage them, as leased circuits are available in the public network. Users on private networks are not allowed to resell unused line capacity. To forestall demand for private circuits, the P&T introduced a digital network in 1980 and hopes to have 300,000 subscribers by 1985. Existing trunks are being replaced with pulse-code modulation (PCM) and microwave links to handle high-speed traffic.

Modems for the Datel network are supplied by the telephone companies (up to 300 bps) or by the P&T (over 300 bps). The user may purchase any terminal equipment and computers as long as they conform to CCITT recommendations. Telex subscribers are free to choose teleprinter equipment supplied and maintained by either the P&T or a private supplier, although the latter must be connected to the telex network via connection equipment supplied by the P&T. Operation is full duplex, and automatic answering or origination of calls is allowed. On the Datex network, the user may also provide his own terminal equipment and computers, as long as they meet CCITT recommendations and are connected to the network via a DCE (data circuit-terminating equipment) supplied and maintained by the P&T. Privately owned modems are allowed on private circuits if they meet technical conditions set by the P&T.

Healthy growth is predicted for data transmission equipment sales. KTAS expects its modem and data terminal installations to grow by 12 percent per year for 1983-87. During 1980, the company installed 946 data modems at subscriber premises, bringing its total to 8,020, of which 2,750 are used for data transmission over the public telephone network and 5,270 over point-to-point connections. Christian Rovsing A/S, a local firm, is a major vendor of data communications equipment. The company has worked closely with the British firm ICL for about 10 years and has installed protocol-conversion units for many of ICL's large data communications networks. Christian Rovsing intends to introduce an integrated digital voice/data switch by 1984.

Other telecommunications equipment. — P&T involvement in **cable television** is limited. Commercial firms and the three telecommunications administrations actually operate the cable television networks with P&T input for type approval of equipment and sample testing of networks. KTAS is running a trial project in a Copenhagen suburb, and JTAS established CATV systems in its region in 1976. During the 1980's, JTAS plans to introduce a hybrid broadband system, using fiber optics in the main branches and traditional cables in the distributed networks. RE Instruments A/S, a subsidiary of Radiometer A/S (Denmark), supplied its Model 800 terminal equipment to JTAS for the experimental CATV network and also serves as a major supplier of radio instruments.

Two Danish companies dominate the market for communications **test and measurement equipment.** Elmi A/S supplies the P&T with test equipment, telephone charge analysis equipment, traffic recorders, and switching signaling systems, but exports 95 to 98 percent of its output to telephone companies and telephone equipment manufacturers in more than 50 countries. RE Instruments A/S produces radio communication measuring instruments and electronic component test equipment. The firm is conducting development work on fiber optic techniques for measurements in fiber optic systems.

Dansk Radio provides **satellite receiving stations** for the International Maritime Satellite Organization (INMARSAT) marine communications system, which Denmark joined in early 1982.

End-User Profiles

Public telecommunications authorities.—Overall responsibility for telecommunications services in Denmark lies with the Minister of Public Works.

Denmark: Basic Economic Indicators

Population:	5.12 million (1983)	Major trading partners:	Germany, United Kingdom, Sweden, United States
Area:	42,994 sq. km.		
Administrative units:	14 counties, 277 communes 88 towns	Exchange rate:	9.163 kroner=US$1 (1983)
		Fiscal year:	Calendar year
GNP:	$56.4 billion (1982)	Current account balance:	—$2,249 million (1982)
Contributions to GDP:	Services 64% (1982)	International reserves:	$3,042 million (1982)
	Industry 32% (1982)	Federal budget	
	Agriculture 4% (1982)	revenues:	$21.36 billion (1981)
Inflation rate:	10.9% (1982)	expenditures:	$24.2 billion (1981)
Exports f.o.b.:	$15.8 billion (1982)	Labor force:	2.7 million (1982)
U.S. share:	$942 million (1982)	Unemployment:	9.8% (1982)
Imports c.i.f.:	$16.7 billion (1982)	Average hourly wage:	$8.64 (1982)
U.S. share:	$1.2 million (1982)		

Useful Addresses

Embassies

American Embassy
Commercial Section
Dag Hammarskjolds Alle 24
DK-2100 Copenhagen O
tf: 42 31 44
tx: 22216

Royal Danish Embassy
3200 Whitehaven Street, N.W.
Washington, DC 20008
tf: 234-4300

Telecommunications administration/PTT

Ministeriet for offentlige arbejder
Generaldirektoratet for Post-og
Telegrafvaesenet
Telestyrelsen
Anker Heegaards Gade 4
DK-1503 Copenhagen V
Attn: Director
tf: 11 33 77
tg: gentel koebenhavn
tx: 27277 teldir dk
tfx: 11 33 77, ext. 220

Regional operators

Kjoebenhavns Telefon Aktieselskab (KTAS)
Telefonhuset
Noerregade 21
DK-1199 Copenhagen K
Attn: Telefondirektoer
tf: 15 10 70
tx: 19791 ktaskh dk
(region of Zealand)

Jydsk Telefon Aktieselskab (JTAS)
Stovej 30
DK-3310 Arhus-Tranbjerg
Attn: Director
tf: 29 33 66
tx: 64320 jtasar dk
tfx: 29 54 99
(region of northern Jutland)

Fyns Kommunale Telefonselskab (FKT)
Klingenberg 16
DK-5100 Odense C
Attn: Director
tf: 00 19
tx: 59803 fktod dk
(region of southern Jutland)

Leased lines and data communications

Generaldirektoratet for Post-og
Telegrafvaesenet
Rigstelefonkontoret
Central Postbygningen
Tietgensgade 37
DK-1530 Copenhagen V
Attn: Director General
tf: 15 66 10
tg: postgen koebenhavn
tx: 22323 gdptt dk

Television broadcasting

Danmarks Radio
TV-Byen
Morkhovj 170
DK-2860 Soborg
Attn: Director General
tf: 67 12 33
tg: danradio koebenhavn
tx: 16467 norvis dk

Radio broadcasting

Danmarks Radio
Radio House
Rosenorns Alle 22
DK-1999 Copenhagen V
Attn: Director General
tf: 35 06 47
tg: danradio koebenhavn
tx: 22695 danrad dk

Technical standards

Dansk Standardiseringsraad (DS)
Aurehojvej 12
Postbox 77
DK-2900 Hellerup
tf: 62 93 15
tg: dankstandard
tx: 15615 dansta dk

No single telecommunications operator, however, covers the entire country. Responsibility is divided between the Posts and Telegraphs Administration and three concessionary telephone companies, the Copenhagen Telephone Company, the Jutland Telephone Company, and the Fyn Telephone Company (FKT).

The Post and Telegraphs Administration (P&T) has two separately budgeted divisions—one for postal services and one for telecommunications. The Telecommunications Division is divided into thre
parts—the Telecommunications Directorate, th
Central Telecommunications Services, and the Tel
communications Regions.

The directorate functions as the managing bod
of the P&T and is responsible primarily for polic
matters and long-range development of custome
services. It determines the range and quality of th
division's main products, develops the principal el
ments of the telecommunications network, and ove

sees yearly allocation of resources. On the international front, it serves as the authority for reaching reciprocal agreements of a general nature.

Each of the Central Telecommunications Services has responsibility for particular activities related to customer service across an entire region—e.g., multiplexing and switching, long lines, subscriber sysems. The services also include international agreements within their fields of activity. The Telecommunications Regions provide customer service and are responsible for establishing and maintaining telecommunications installations in a particular geographic area.

Services provided by the P&T include: trunk elephone service between the geographic areas served by the three major telephone companies; elephone service in connection with the Faeroe slands, Greenland, and foreign countries; local telephone service in South Jutland and the island of Mon; national and international telex and telegraph services; the fonotelex service; the Datel and Datex data transmission services; telefax service; mobile elephones; and maritime communications. The P&T s also responsible for all radio and TV broadcastng, except military and approved private broadcastng.

Denmark, a full member of the Common Market, participates in formulating policies in the telecommunications forum of the European Economic Community and relies heavily on international trade in he telecommunications market. Denmark's P&T is n active member of the International Telecommunications Union, and Denmark has ratified the international agreement on INMARSAT.

Each of **the three regional telephone companies** is responsible for the local and trunk telephone service within its own geographic area. They also operate he telefax service and the Datel service up to 300 bps.

KTAS, the largest of the three firms, provides elephones to about 45 percent of Denmark's citizens. The company, 65.3 percent owned by the Danish Government, supplies all telephone service in the islands of Zealand (where Copenhagen is located), Lolland-Falster, and Bornholm. Its customer area covers 3,700 square miles, containing 1.2 million subscribers using 1.7 million telephones. The company employs 7,300 workers.

Domestic calls in 1981 numbered 1.7 billion, bout 3 percent higher than in 1980. KTAS uses upto-date equipment to handle this increased usage and can accommodate services such as data transmission, telefax, alarm systems, and special circuits for special purposes. It is presently replacing conventional transmission systems with PCM systems CCITT standard).

KTAS anticipates a major expansion program during the 1980's, especially for closed circuit TV transmission, alarm, and surveillance systems. Its 1982 investment budget totaled $100 million, including $20 million for exchanges, $24 million for cable, $38 million for subscriber installations, and $7.4 million for multiplex plants. KTAS, with only about 30 R&D engineers, relies on outside vendors for equipment, which is purchased locally if available.

JTAS, with 64 percent of its stock owned by the Danish Government, provides telephone services in middle and northern Jutland plus several outlying islands. Approximately 866,000 JTAS subscribers use 1.3 million telephone sets and more than 12,000 PABX's. The company's network circuit totals 6 million kilometers, about 1.7 million of them multiplex; in 1981, it handled 1.2 billion domestic calls, almost 1,400 per subscriber. In 1982, the JTAS investment budget amounted to $87 million, including $41 million for the line network, $12 million for the trunk network, and $12 million for exchanges.

Although smaller than KTAS, JTAS is probably more advanced technically. Its staff of 4,500 people includes 300 skilled personnel devoted to research and development, enabling JTAS to take an active part in formulating Denmark's future programs. The R&D section, in conjunction with Standard Electric Kirk, recently developed a digital base telephone that is available in many configurations, including features such as built-in memory for up to 60 preset numbers, digital display, data transmission terminal features, and a printer. JTAS pioneered in ordering digital test exchanges and now uses such equipment.

JTAS' corporate policy is to use locally made equipment as much as possible. Almost all the handsets are made by Standard Electric Kirk, with some sets from GNT and L. M. Ericsson also available. The company also cooperates with a number of local electronics firms and with NKT on optical fiber cable and terminals.

In addition, JTAS has formed a division called Jutland Telecom International (JTI) to export Danish-made products and to provide consultant and turnkey projects. JTI offers customer data administration, stock control, directory assistance, absent-subscriber systems, digital mapping, storage and updating of data, identification of existing underground cable networks, and designs for new ones. The division will also plan and implement complete telephone, CATV, data communications, and alarm transmission systems.

FKT, the smallest of the three telephone companies, services 185,000 subscribers on southern Jutland and the island of Funen. The company, whose stock is owned primarily by the townships it serves, handled 236 million domestic calls in 1981, averaging more than 1,500 calls per subscriber.

FKT's 1982 investment budget totaled $19 million, with $10 million earmarked for subscriber devices and $4 million for central equipment. The company's 30-channel systems now number 107, and two 120-channel PCM systems are also in use, with all the FKT centrals boasting PCM equipment. The firm employs 935 people, and on technical matters works closely with JTAS.

Rigstelefonen, the State telephone service, is actually a branch of the P&T, although it functions as a telephone company. Operating in southern Jutland in an area close to the German border that was returned to Denmark after the First World War, Rigstelefonen was directed by the Danish Government to rapidly bring the area's infrastructure up to the standards of the rest of the country. It has been responsible for the area's telephone service ever since.

Radio and television (Danmarks Radio).—Radio and TV broadcasting in Denmark functions as a State monopoly under the control of a director general who reports to the Radio and TV Council (Radioraadet), a committee appointed by Parliament, user organizations, and staff representatives of Danmarks Radio. Commercials are prohibited in the Danish system; programs are financed by user fees.

Stringent legislation limits broadcasting to the State monopoly, and all radio and TV transmitters are owned and operated by the P&T. Studio equipment is purchased by Danmarks Radio. Radio broadcasts are made on the FM, midwave, longwave, and shortwave bands. The television authorities operate only one program schedule nationwide. Continuous debate goes on about a second program schedule or channel and whether it should be under the State monopoly or commercially operated. In the meantime, licenses have been given on a limited test basis to various consumer and other groups to carry out some regional radio and closed circuit TV broadcasting.

Other end-users.—Denmark's armed forces maintain a modern level of electronics and telecommunications equipment as part of their defense activities. As a NATO member, Denmark submits large projects as tenders, through the respective Materiel Commands, to the NATO partners for bidding.

Shipping companies are of great importance to Denmark's foreign exchange earnings and also make major use of communications equipment. The Danish merchant fleet ranks 18th in size and among the most modern in the world. In January 1982, it consisted of 670 vessels, more than half of them less than 1 years old. Denmark also maintains a relatively larg fishing fleet, part of which is expected to invest i satellite communication and navigation equipment.

Marketing Practices

Danish end-users demand competitive prices ar reliable products. They are interested in U.S.-ma goods but seldom purchase directly from forei suppliers. To succeed in the Danish market, vendo need a permanent market presence either through wholly owned subsidiary or through a local repr sentative with sales and service capabilities. Inte national conferences and exhibitions, particular the ITU conference and show in Geneva, also off good marketing opportunities, since Danish buye travel abroad extensively to keep abreast of ne developments.

Trade Restrictions and Technical Standar

Merchandise entering Denmark is subject to t Common Market External Tariff (CXT). In add tion, a value-added tax of 22 percent is levied on sales, whether imported or locally produced. Specif tariffs also apply to various categories of telecom munications equipment from abroad.

The Danish P&T must approve all communic tions equipment prior to sale. Type approval required for mobile telephones and special purpo telephone and telefax equipment. Danish technic standards are often based on international standar such as CCNT and ISO.

Additional Information

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Country Market Survey

Food Processing and Packaging Equipment

Netherlands

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

For a nation of only 14 million people, the Netherlands offers a disproportionately large market for food processing and packaging equipment: some $445 million[1] in 1981 (see table 1). However, sales growth is not matching that of past years as many Dutch food and beverage processors trim plant and equipment investments. Prolonged economic stagnation at home has limited the food industry's domestic prospects. Also, recession among Holland's major trading partners has curtailed food and beverage exports, which amounted to over 40 percent of industry turnover in 1980. Nevertheless, Dutch food and beverage processors are among the most efficiency-conscious in the world, and their insistence on the latest technology is expected to sustain demand at its current high level. New investment in several thriving food and beverage sectors will more than offset spending cuts in other areas, and modest 2.5 percent annual market expansion is forecast, to $491 million in 1985.

U.S. manufacturers, who in 1981 provided almost 10 percent of Holland's $250 million worth of food processing and packaging equipment imports, enjoy an excellent reputation among equipment buyers in the Netherlands (see table 2). A strong dollar poses no serious threat to the competitiveness of U.S.-built machinery since purchasing decisions are based more on technical performance than on price. Trade sources insist that American suppliers could easily expand their share of imports to 12.6 percent by mid-decade, capturing projected sales of $36.5 million in 1985.

Purchases of **food processing equipment** in the Netherlands amounted to $325 million in 1981. Dutch food and beverage companies are actively opening up foreign markets for their products to counteract sluggish domestic food consumption. As new outlets develop, processors are expected to revamp their production lines to meet increased foreign demand. Several sectors—notably beverages, snacks, and seafood—are also expected to invest in automated machinery in light of strong local sales. In all, the market for food processing equipment is forecast to expand some 2.2 percent annually, to $354 million in 1985.

Table 1.—Netherlands: The market[1] for food processin and packaging equipment, 1980, 1981, and projecte 1985

(in thousands of U.S. dollars)

	1980	1981	1985
Food processing equipment			
Production	198,038	214,500	240,00
Imports	134,015	129,400	165,00
Exports	21,226	18,900	50,58
Market size	310,827	325,000	354,41
Food packaging equipment			
Production	101,233	105,500	120,00
Imports	107,005	120,600	125,00
Exports	92,765	106,100	108,21
Market size	115,473	120,000	136,78
Total food processing and packaging equipment			
Production	299,271	320,000	360,00
Imports	241,020	250,000	290,00
Exports	113,991	125,000	158,80
Market size	426,300	445,000	491,20

[1] Size of market equals production (ex factory value) plus impor (c.i.f.) minus exports (f.o.b.). Parts are excluded.

Source: International Trade Administration, Office of Trade I formation Services research report, "The Market for Food Processi and Packaging Equipment in the Netherlands" (see Additional I formation box). Figures in this report are based on data gathered the Netherlands, including available government statistics, indust reports, and trade source estimates and projections.

The preparation of food and beverage products for export sale also underlies the 3.3 percent per annum expansion projected in sales of **food packaging equipment**, from $120 million in 1981 to nearly $137 million in 1985. Three prominent food industry sectors—dairy products, preserved fruits/vegetables/specialty products, and beverages—ar expected to account for two-thirds of 1985 packag ing equipment purchases (see table 3). Dutch con sumers are becoming increasingly receptive to so phisticated packages, prompting food processors t step up their investment in advanced wrapping an packing machinery.

Competitive Environment

Imports supplied some 56 percent of the marke for food processing and packaging equipment i 1981. Despite impressive expansion in domestic ou put, Dutch buyers are expected to continue thei reliance upon foreign vendors for specialized ma chinery not available locally. Purchases from foreig suppliers are forecast to account for an expande 59 percent of the market in 1985.

With sales of $24 million in 1981, U.S. vendor ranked second only to Holland's German neighbor as a source of supply. American food processing an packaging technology is readily acknowledged a unmatched, and Dutch buyers enjoy doing busines with U.S. firms. Industry observers expect future in vestments to include heavy spending on innovativ computerized processes, which would mean extr sales of American equipment.

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[1] All values are shown in U.S. dollars. Local currency data for all years are converted at the exchange rate of US$1=2.1345 guilders. Values for years through 1981 are expressed in current rather than constant dollars; values for 1982 and subsequent years are expressed in 1981 constant dollars.

German manufacturers accounted for 52 percent f food processing and packaging equipment im- orts in 1981. Easy access to the Dutch market gives erman suppliers a natural edge, and they exploit by providing excellent service and reliable, if chnologically ordinary, equipment. German endors often provide service after hours and on eekends, something even local competitors rarely o. A slightly diminished 50 percent share of im- orts is forecast for German-source shipments in 985. The decline reflects the anticipated increase the market's technological sophistication, which expected to cost some German sales.

No other supplier captures as much as 10 percent imports. France launched an intensive marketing fort in 1981 that boosted its sales to $23.5 mil- on (9.4 percent of total imports). Competitors from e United Kingdom, enjoying longstanding business es with Dutch food processors, sold them almost 20 million worth of processing and packaging uipment in the same year. Solidly established sitions in selected market segments characterize witzerland's participation in the Netherlands. In 981, Swiss suppliers accounted for 7.4 percent of ports, with sales of $18.6 million.

Holland boasts a strong domestic food processing d packaging equipment industry, with more than 0 firms producing output valued at $320 million 1981. Many local manufacturers originally arose serve such prominent Dutch food sectors as meat, iry products, and beverages, but their current preoccupation is exporting. By launching a worldwide sales campaign, domestic equipment suppliers hope to generate foreign exchange, reap tax benefits, and overcome the limitations of their small home market. Sales to foreign markets amounted to 39 percent ($125 million) of production in 1981, and the industry hopes to expand that share to 44 percent ($159 million) by 1985.

Stork-VMF, easily the largest Dutch supplier, manufactures a broad range of both processing and packaging machinery at plants across the Netherlands. Stork Amsterdam makes dairy processing equipment and a variety of packaging and container handling machinery for the beverage, dairy, and miscellaneous food products sectors; Stork Brabant produces complete poultry processing plants; Stork-Friesland manufactures evaporators and spray driers; Stork Plaatwellerij provides slaughterhouse equipment and batch rendering systems; Stork-Duke makes continuous rendering systems; Stork-Werkspoor Suiker designs and produces turnkey sugar refineries; and another Stork subsidiary, Alpha Engineering, custom-builds entire food processing plants.

Most Dutch manufacturers of food processing and packaging equipment are domestically owned, but several multinational ventures play an important role. Dupps (U.S.) has ties with the influential Stork-VMF Group; Germany's Robert Bosch operates with Hamac-Hansella; Alfa-Laval (Sweden) has a Dutch plant; Dorr-Oliver (U.S.) sells out of Delft;

Table 2.—Netherlands: Imports of food processing and packaging equipment by country of origin, 1980, 1981, and projected 1985

	1980		1981		1985	
	Value ($ thousands)	Share (%)	Value ($ thousands)	Share (%)	Value ($ thousands)	Share (%)
od processing equipment						
United States	11,954	8.92	11,969	9.25	21,450	13.00
Germany	71,216	53.14	67,288	52,00	82,500	50.00
France	8,014	5.98	9,058	7.00	14,850	9.00
Switzerland	8,483	6.33	7,764	6.00	8,250	5.00
United Kingdom	6,848	5.11	7,764	6.00	13,200	8.00
Other countries	27,500	20.52	25,557	19.75	24,750	15.00
Total	134,015	100.00	129,400	100.00	165,000	100.00
od packaging equipment						
United States	10,486	9.80	12,060	10.00	15,000	12.00
Germany	56,948	53.22	62,712	52.00	62,500	50.00
France	11,792	11.02	14,472	12.00	15,000	12.00
United Kingdom	10,444	9.76	12,060	10.00	11,250	9.00
Switzerland	10,390	9.71	10,854	9.00	10,000	8.00
Other countries	6,945	6.49	8,442	7.00	11,250	9.00
Total	107,005	100.00	120,600	100.00	125,000	100.00
Total imports	241,020		250,000		290,000	
Total imports from U.S.	22,440		24,029		36,450	

ource: See source notation of table 1.

Table 3.—Netherlands: Sales[1] of food processing and packaging equipment, by end-user sector, 1980 and projected 1985

(in thousands of U.S. dollars)

	Food processing equipment		Food packaging equipment	
	1980	1985	1980	1985
Meat, poultry, and eggs	74,120	82,025	13,080	14,475
Dairy products	112,104	127,170	26,296	29,830
Preserved fruits, vegetables, and specialty products	13,186	17,025	21,514	27,775
Grain mill products	9,256	9,525	1,144	1,175
Bakery products	14,427	17,325	8,473	10,175
Sugar and confectionery products	28,968	23,250	13,632	10,950
Fats and oils	16,400	19,100	3,600	4,200
Beverages	31,806	43,375	23,994	32,725
Fish and seafood	1,848	3,100	352	600
Miscellaneous food products	8,712	12,520	3,388	4,880
Total	310,827	354,415	115,473	136,785

[1] Values exclude duties, taxes, and distribution costs.
Source: See source notation of table 1.

and Simon Engineering (U.K.) owns Simon-Heesen at Boxtel.

Food processing equipment.—The domestic industry provides well over half of Holland's food processing equipment; imports of $129.4 million in 1981 supplied about 40 percent of the market. The growing need for advanced, often computerized or microprocessor-based processing equipment that is not available within the Netherlands is expected to boost imports at a 3.8 percent annual rate, raising foreign vendors' share of the market to 46.6 percent in 1985.

U.S. suppliers are expected to be among the major beneficiaries of Dutch demand for sophisticated processing machinery. From some $12 million (9.2 percent of imports) in 1981, U.S.-source shipments are forecast to rise almost 16 percent a year to $21.5 million in 1985, lifting the American share of imports to 13 percent. Excellent sales prospects are foreseen for a number of U.S.-built items in the meat, poultry, and eggs sector, as well as in the dairy products, fruit and vegetable, bakery products, and soft drinks sectors. Strong demand is also anticipated for numerous miscellaneous food products processing machines offered by U.S. suppliers (see Best Sales Opportunities for U.S. Exporters for a complete list). Among the American vendors identified by trade sources as prominent suppliers are Bettcher (carving machines), Biro (meat mincers); and Townsend (lard machinery).

Selling a full range of processing equipment to all food sectors, German manufacturers head the list o third-country vendors, capturing sales of $67.3 million (52 percent of imports) in 1981. Major Germa competitors in Holland include Linde (freezin equipment), Winkler & Dunnebier (bakery, sugar and confectionery machinery), Seeger (brewin equipment), Westfalia Separators (dairy processin apparatus), Ahlborn (pasteurizers, heat exchangers and coolers), Braunschweigische Maschinenbauanstalt (sugar and confectionery equipment), Maka (tableting machines), Seidelmann (meat cutters), an Werner & Pfleiderer (bakery machinery). By 1985 German-source shipments are forecast to climb t over $82 million a year, representing half of projected imports.

Suppliers from France are expected to boost thei sales a substantial 13 percent per annum over th 1981-85 period, from $9.1 million to nearly $1 million. French firms are noted for their fish, fruit and vegetable processing equipment, coffee and te preparation machinery, filters and other purifiers fo edible fats and oils, and heat exchangers. Prominen vendors include Bongard (electric ovens), Sofino (grain processing machinery), Grace-Cryovac (mea processing machinery), Pierre Pont (bakery flow lines), SEPCO (bread-making machinery), Marchan & Meunier (dehairing equipment), and Frigino (freezers). Also successful are Cobral (bakery an delicatessen processing machinery), Pavailler (baker equipment), Cloix (freezing and defreezing units) and Scheyen (ovens).

U.K.-source imports are also forecast to sho impressive growth, rising at a projected 14 percen a year to $13.2 million in 1985. British companie provide machinery used in refining edible fats an oils, bakery ovens, and heating equipment fo preparation of chocolate and confectionery products Leading British suppliers include Simon Engineerin and Gardner (both grain processing equipment), Stella Meta (beverage filters), Baker Perkins (baker systems), Jahn (cookie fillers), and APV (dair machinery).

Switzerland's Alpina and the Swiss-German venture, Buhler-Miag, have been successful with equipment for milling and preparing grain, kneading dough, and manufacturing confectionery products. Dutch purchases from Swiss concerns totaled $7.8 million in 1981 and are projected to rise to $8.3 million by 1985. Among other third-country competitors, Swedish firms, such as Alfa-Laval and Frigoscandia market dairy processing and beverage carbonation and purification equipment. The Italian companies, Foemm, Detroit SEM, and Rheninghaus, sell evaporators, condensers, liquids purifiers, and apparatus for the confectionery sector. Van Caspel, Lemartre, and FMC-Europe, all in Belgium, provide

Netherlands: Best Sales Opportunities for U.S. Exporters of Food Processing and Packaging Equipment

Meat, Poultry, and Egg Processing Equipment

- Tenderizers
- Sawing machines
- Lard plasticizers
- Compactors
- Dehairing machines
- Molding machines/presses
- Poultry defeathering and eviscerating equipment
- Rendering equipment
- Frozen meat flakers/slicers/cubers
- Boning machines
- Power cleavers
- Sausage stuffing machines
- Slaughtering equipment
- Meat grinders
- Meat blenders
- Microwave temperers
- Low voltage meat stimulators
- Meat analyzers

Dairy Products Manufacturing Equipment

- Condensed/evaporated milk equipment
- Centrifugal milk clarifiers
- Ice cream preparation/freezing/cutting/coating equipment

Fruit and Vegetable Processing Equipment

- Rotary blanchers
- Trimmers
- Huskers, corn
- Juice extractors
- Abrasive peelers
- Dry peelers
- Graders
- Continuous blancher/cooker/cooler/sterilizer systems
- Dehydrating equipment
- Pickling equipment
- Cyclonic flotation destoners
- Shredding/grinding/chopping machines
- Strip cutters/slicers, etc.
- Carrot toppers

Grain Mill Products Manufacturing Equipment

- Flour bleaching machines
- Flake-making machines
- Computerized control equipment

Bakery Products Manufacturing Equipment

- Bread-making machines
- Biscuit-filling machines
- Dough mixing/kneading/dividing/rounding/proofing machines
- Hamburger bun equipment
- Pastry rolling calenders
- Pie machines
- Shaping machines
- Biscuit/wafer/cracker machines
- Cake depositing/icing machines
- Continuous process ovens
- Conventional ovens
- Pizza equipment

Sugar and Confectionery Products Manufacturing Equipment

- Crystallizing apparatus
- Juice extractors
- Shaping machines
- Tableting machines
- Pulling machines

Fats and Oils Processing Equipment

- Physical refining equipment

Beverage-Making Equipment

- Brewing and distilling equipment
  - Straining vats
  - Rectifying plants
  - Clarifiers
  - Homogenizers
  - Sterilizers
  - Mashing vats with agitators and heating elements
- By-products equipment (grain and yeast)
  - Sulphiting equipment

Soft drinks, flavoring extracts, and syrups equipment

- Filtering machinery
- Carbonating equipment
- Concentration control equipment

Fish and Seafood Processing Equipment

- Filleting machines
- Mixer-grinders
- Fish deboning equipment

Miscellaneous Food Products Manufacturing Equipment

- Coffee mills/grinders/blenders/roasters
- Macaroni extruders/dryers
- Snack food fryers
- Snack food extruders

Multi-Product and General Purpose Food Processing Equipment

- Liquid nitrogen tunnel freezers
  (most salable in miscellaneous food products sector)
- Blast freezers
  (miscellaneous food products sector)
- Continuous IQF (instant quick freeze) systems
  (dairy products, frozen foods sectors)
- Compressors
  (dairy products, frozen foods sectors)
- Condensers/evaporators
  (dairy products, frozen foods sectors)
- Refrigerated bulk cooling tanks
  (dairy products, frozen foods sectors)

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Netherlands: Best Sales Opportunities for U.S. Exporters of Food Processing and Packaging Equipment — Continued

Continuous carton freezing equipment
  (frozen foods sector)
Heat recovery systems and equipment
  (bakery products sector)
Heat exchange process systems:
  Scraped surface
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Infusion Heater
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Plate
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Infrared
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Cookers:
  Continuous
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Batch
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Vacuum
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Microwave ovens
  (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Continuous mixers:
  Solids/solids
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Solids/liquids
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
  Liquids/liquids
    (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Continuous blending/whipping/chilling units
  (dairy products sector)
Aseptic systems for processing and bulk storage of products from single strength to concentrates
  (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Aerators
  (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Blenders
  (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Essence recovery systems
  (meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)
Continuous on-line color control systems
  (sugar/confectionery products, beverages sectors)
Recording thermometers for time/temperature cook cycles
  (meat/poultry/eggs sectors)
Texture testers
  (meat/poultry/eggs, dairy products, preserved

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Netherlands: Best Sales Opportunities for U.S. Exporters of Food Processing and Packaging Equipment — Continued

fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Valves
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Materials handling equipment
Bag opening/dumping equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Accumulators
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Conveyors and conveying equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Automatic feeders/flow controllers
(beverages sector)

Can control equipment
(fruits/vegetables/specialty products, beverages)

Rotary positive pumps
(dairy products, beverages sectors)

Crateless retort systems
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Forming, Filling, and Sealing Equipment

2-piece can-making machinery
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

3-piece can-making machinery
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Injection blow molders
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Fillers for carbonated liquids
(beverages sector)

Fillers for liquids
(dairy products , beverages sectors)

Fillers for dry products
(grain milling sector)

Fillers for viscous products
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Fillers for solids
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Heat sealers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Vacuum form/fill/seal systems
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Gas form/fill/seal systems
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Wrapping, Packing Equipment

Wrappers:
Direct
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Outer
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Overwrap
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Cartoners
(meat/poultry/eggs, dairy products, preserved

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fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Multipackers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Shrink wrappers and tunnels
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Liquid packaging equipment — milk
(dairy products sector)

Stretch wrapping equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Marking, Inspecting Equipment

Labelers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Coding equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Checkweighers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Level checking equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Code/label inspecting equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Imprinting/printing equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Weighers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Seam testers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Bar coding equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Container/Product/Package Preparation and Handling Equipment

Box setting-up equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Palletizers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Bottle spotters
(beverages sector)

Container cleaning/washing/drying systems
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Accumulators/collators
(beverage sector)

Feeding/orienting equipment
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Unloaders
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

Stackers
(meat/poultry/eggs, dairy products, preserved fruits/vegetables/specialty products, grain milling, bakery products, sugar/confectionery products, fats/oils, beverages, fish/seafood, frozen foods, miscellaneous food products sectors)

vegetable processing and brewery equipment. And such Danish vendors as Herstrop, Gerstenberg, Paasch & Silkeborg, and Sabroe-Atlas are active marketers of freezers and machinery for processing meat, milk, and margarine.

Locally, some 75 companies specialize in processing machinery. Their output, which topped $214 million in 1981, is forecast to rise to $240 million by 1985. The larger firms include Grenco, a leading maker of refrigeration equipment, and two manufacturers of bakery plants, Benier and Van Dijk. Ensink and Finis both specialize in continuous front extraction equipment, while Florigo has pioneered several pieces of snack food equipment. Other notable Dutch vendors include Menzing (machinery for processing meat and preserves), Ottevanger (grain mill equipment), Terlet (brewery and distillery plants, equipment for making preserves), and Goud'sche Machinefabriek (rotary driers).

Food packaging equipment. — Imports of food packaging equipment are forecast to expand less than 1 percent per annum to $125 million in 1985, representing over 90 percent of total Dutch purchases. American manufacturers captured 10 percent of imports in 1981 with sales of $12.1 million, and they are expected to raise their share to 12 percent ($15 million) by 1985. Demand is said to be excellent for numerous types of U.S.-built packaging machines, notably fillers for all kinds of products, gas form/fill/seal systems, wrapping and packing equipment, checkweighers, bar coding equipment, feeding/orienting equipment, unloaders, and stackers. Prominent suppliers to the Netherlands market include Branson Sonic (ultrasonic scalers), Loveshaw (carton-making machinery), Aro (adhesive devices), Mark Andy (flexographic equipment); John Burton bottle conveyors), Packaging Machinery (form/fill baggers), National Controls (digital weighers), and Jones (cereal cartoners).

Germany's 1981 sales of packaging equipment worth $62.7 million amounted to 52 percent of mports. A slight decline in German-source shipments (to $62.5 million, or 50 percent of imports) s foreseen for 1985. Principal suppliers are Hesser Maschinenfabrik (dry products packaging machinery); Holstein & Kappert and Enzinger Union (both bottling equipment); Seitz (miscellaneous food products packaging apparatus); Hamba Maschinenfabrik fillers for dairy products); Weiss, Krones, August Herbort (all labelers); and Chronos (flour baggers).

The French accounted for 12 percent of Holland's mports of food packaging machinery in 1981. From 14.5 million, their shipments are forecast to grow o $15 million by 1985. The most active French rms on the Dutch market include FEMIA (can and ar fillers), Grace-Cryovac (meat and baked goods packaging equipment), Lin-Pac (shrink wrap machinery), and Levy (cartoners).

U.K. manufacturers sold Dutch food processors some $12 million worth of food packaging equipment in 1981. Britain's Dawson and Barfos sells bottling equipment, Meyer Dumore makes packaging machinery for beverages, Kliklok International markets box packaging devices, Neumo manufactures automatic fillers, and Lawtons offers coding systems. Among other successful third-country suppliers, Swiss firms, including Gasti (auto-crating machinery), account for about 9 percent of Dutch imports. Competition also comes from Sund Emba of Sweden, Belgium's Crown-Baele, Manuli and Grandi Lavastoviglie of Italy, as well as the Canadian concern, Portion Packaging.

Holland's own food packaging equipment industry comprises about 25 firms. From $105.5 million in 1981, production is forecast to rise about 3.3 percent a year, to $120 million in 1985. Most locally built machinery is exported, primarily to Asia, Africa, and North and South America. Breda Packaging, part of the giant Rijn-Schelde-Verolme Group, is Holland's leading manufacture of case packaging systems, palletizers, and pallet shrink lines. Berkel Constructie is the biggest builder and exporter of weighers. Other key producers of packaging equipment include Essor, which makes case gluers and sealers, and De Hoop, a prominent supplier of wrapping and packaging machinery, shrink tunnels, palletizers, and labeling equipment.

The Food Processing Industry

Holland's food processing industry comprised some 1,502 establishments with 10 or more workers in 1980 (see table 4). These firms employed a total of 133,000 people to generate sales of nearly $15.8 billion (see table 5). Only 9 percent (141) of Dutch food processors employ more than 250 people. And even though large corporations and cooperatives still account for the lion's share of food output, industry sources suggest that small establishments may be making a comeback. In contrast to the trend to conglomeration of the early 1970's, the food industry in the Netherlands currently shuns mergers and acquisitions. The growth of firms that now employ fewer than 10 workers is expected to account for much of the industry's expansion.

The meat, poultry, and eggs sector and the dairy products sector together accounted for half the food industry's sales in 1980. Processors of fats and oils, beverages, bakery products, and sugar and confectionery products added another 35 percent of output. Despite high labor costs, fully $6.5 billion of output was exported to buyers in virtually all

Table 4.—Netherlands: Total employment and number of establishments, by size,[1] in food processing industry sectors, 1980

Sector	Total employment	Number of establishments Total	Large	Medium	Sm
Meat, poultry, and eggs	22,900	277	21	68	1
Dairy products	23,020	124	17	74	
Preserved fruits, vegetables, and specialty products	10,941	114	10	12	
Grain mill products	2,005	18	6	9	
Bakery products	18,742	378	22	48	3
Sugar and confectionery products	12,278	82	7	60	1
Fats and oils	4,508	17	6	5	
Beverages	12,901	74	40	27	
Fish and seafood	1,404	16	2	10	
Miscellaneous food products	24,432	402	10	283	1

[1] Size of establishments is based on number of employees, as follows: large, 250 or more; medium, 50 to 249; and small, between 10 and
Source: See source notation of table 1.

parts of the world. Three sectors (meat, poultry, and eggs; dairy products; fats and oils) accounted for over 80 percent of the country's 1980 exports.

At home, demand languishes. Dutch food consumption has actually declined over the past 10 years. But sales of some products continue to climb, as reflected in growing past and projected output of frozen meat, cheese, yogurt, canned and frozen fruits and vegetables, breakfast cereals, pastries, beverages (beer, liquor, and soft drinks), and snack foods (see table 6). Production of all types of frozen food—from meat, chicken, fruit and vegetables to ice cream—is forecast to show substantial growth between 1980 and 1985. Emerging concern over excessive intake of starchy and oily foods is expected to mean increased popularity for specialty diet foods in the coming years. Some households express a desire to retlrn to fresh rather than processed foods. Moreover, the concept of work sharing is gaining momentum in Holland and could have the indirect effect of enabling consumers to spend more time preparing meals from scratch.

To meet or anticipate changing demand, the Netherlands food industry invested $426.3 million in new food processing and packaging equipment in 1980. Trade sources say this relatively low overall investment plowback (only 2.7 percent of total receipts) reflects the industry's ambivalence about the future. Equipment spending as a percentage of sales ranged from only 1.1 percent for the fats and oils sector to almost 4.7 percent for the preserved fruits, vegetables, and specialty products sector. The dairy, sugar and confectionery, and beverage sectors all invested over 3 percent of their 1980 sales. The meat, dairy, and beverage processors together accounted for about two-thirds of equipment spending in 1980, with the dairy sector alone contributing nearly one-third ($138.4 million) of the total.

Sales of packaging equipment to the Dutch fo industry reflect the importance of the dairy, beve age, and preserved fruit and vegetable sectors. Co tainer forming/filling/sealing systems constitute t largest category of packaging equipment sold in t Netherlands, with sales of vacuum and gas syste alone accounting for 11 percent of the market 1980 (see table 7). Above average growth is p dicted for sales of wrapping equipment, and t increased mechanization of food product wholesali and retailing is likely to mean heavier demand f inspection equipment, container handling machine and coding equipment.

Despite the current abundance and lower pric of petroleum-based plastic packaging materia Dutch users are fearful of potential supply disru tions in the future. Moreover, many consume believe that plastic containers unpleasantly flav their contents. Despite high prices, paper and boa containers are likely to remain the choice for ma food packaging applications in the Netherlands (s table 8). Tinplate is expected to retain its virtual unchallenged position for selected products, a glass has come back into favor for many fluid Rapid growth is anticipated in the use of aluminu foil, highly praised by food processors for its e appeal, strength, price, and availability.

The following section profiles each of the ten us sectors in the Dutch food processing industry.

Meat, poultry, and eggs processing. — Near 23,000 workers in 277 establishments process meat, poultry, and eggs worth close to $3.8 billi in 1980. Currently, about 45 medium and large fir supply two-thirds of the market. Leading me processors include Zwan, Boas, Coveco, Uno Zwanenberg (subsidiary of Unilever), Stegeman, a Homburg, while Van den Berg and Goossens a rominent poultry processors. The sector's structure s said to be stable; no major mergers or new entries re anticipated until demand picks up.

Fresh meat output declined sharply between 1975 nd 1980. Production of frozen meat, on the other and, jumped 56 percent, with an additional 45 ercent hike to 66 million kilograms (kg) projected or 1985. Conversely, fresh poultry output more han doubled from 1975 to 1980, while output of rozen poultry fell 10 percent. Output of both fresh nd frozen poultry is forecast to show moderate rowth over the 1980-85 period. Trade sources also eport that the growing domestic consumption of neat at fast-food restaurants and the rising demand or prepared trays of ready-to-cook mixed meals is xpected to influence the sector's growth.

Raw materials supplies, all but 5 percent from omestic and intra-European Economic Community EEC) sources, are said to be ample for the sector's eeds. There is also enough excess capacity to handle nticipated expansion of both local and export demand. Dutch shipments to other countries amountng to nearly 100 million kg of processed meat were alued at $1.84 billion, or 49 percent of the sector's tal sales, in 1980. About half of the exports stay ithin the EEC; the remainder is delivered to the etherlands Antilles, Surinam, the United States, apan, and South Africa.

Meat, poultry, and egg processors are unlikely to vest heavily in new plants and equipment until emand improves. Most facilities are already highly tomated, thus the sector's purchases of processing uipment are projected to grow just 2 percent a ear, to $82 million in 1985. Current technology is pified by the Unox plant, which processes some to 22 metric tons (mt) a year. Equipment includes rge boning machines, derinding apparatus, comctors, ham injectors, and high-speed slicers (all om U.S. sources); meat cutters and saws from erman manufacturers; and locally built beaters, ining devices, frozen meat flakers, dehairing equipent, and gutting machinery. New techniques under dy in the sector encompass pH and moisture moniring, automatic portion control, vacuum process eat stuffing, egg-breaking and egg-spreading dees, and devices which form meat into patties, eatballs, steaks, or roasts.

Purchases of packing equipment are forecast to pand from $13.1 million in 1980 to $14.5 million 1985. Dutch meat processors are testing an ergy-saving packaging and vacuum forming maine and a double capacity stretch wrapper. They also experimenting with point-of-sale wrapping uipment, which is said to offer U.S. vendors exlent potential. Packaging materials in use include stics, aluminum foil, and pulpboard. Aluminum packaging is on the rise, largely at the expense of plastic, and widely used multimaterial packaging systems are expected to remain in demand.

Dairy products manufacturing.—In light of Holland's traditional image as a supplier of dairy products, it is hardly surprising that dairy products manufacturing leads the Dutch food industry in sales, exports, and capital spending. The sector's 124 establishments in 1980 employed about 23,000 workers and generated sales of $4.2 billion. Two leading farmers' cooperatives are major suppliers. CMC Melkunie provides over 20 percent of the milk, and Frico accounts for 11 percent of cheese production. Other prominent equipment buyers in this sector include Nutricia, Hollandia Fabrieken van Melkprodukten en Voedingsmiddelen (subsidiary of Nestle), Nederlandse Melk-Unie (the country's largest marketer of milk for direct consumption), Menken Landbouw, Comelco, and AMC. In contrast to the previously noted trend toward disaggregation in the Dutch food industry, the dairy sector recently completed an extensive rationalization program, centralizing operations and closing numerous small plants to cut expenses. As a result, labor costs have risen only 3 percent since 1978. However, centralization means heavier reliance on milk storage and transportation equipment, and some pilot installations are shipping milk via direct farm-to-factory pipelines.

Substantial growth in production is anticipated for cheese, ice cream, and yogurt over the 1980-85 period. Export demand accounts for much of the

Table 5.—Netherlands: Annual capital expenditures and sales by food processing industry sectors, 1980

(in millions of U.S. dollars)

Sector	Annual capital expenditures	Sales Total	To domestic market	To export markets
Meat, poultry, and eggs	87.2	3,790	1,948	1,842
Dairy products	138.4	4,209	1,894	2,315
Preserved fruits, vegetables, and specialty products	34.7	743	297	446
Grain mill products	10.4	548	517	31
Bakery products	22.9	1,090	1,008	82
Sugar and confectionery products	42.6	1,239	927	312
Fats and oils	20.0	1,794	700	1,094
Beverages	55.8	1,300	996	304
Fish and seafood	2.2	114	87	27
Miscellaneous food products	12.1	952	903	49
Total	426.3	15,779	9,277	6,502

Source: See source notation of table 1.

Table 6.—Netherlands: Output of major processed food products, 1975, 1980, and projected 1985

Sector/product	Units	1975	1980	19
Meat, poultry, and eggs				
Fresh meat	million kilograms	233	173	1
Fresh poultry	milliion kilograms	52	110	1
Bacon and ham	million kilograms	12	12	
Sausages, fresh, frozen, and butcher-made	million kilograms	88	89	1
Frozen meat	million kilograms	29	46	
Frozen poultry	million kilograms	234	212	2
Canned meats	million kilograms	30	32	
Dried, canned, and frozen eggs	thousand metric tons	49	37	
Dairy products				
Butter	million kilograms	204	203	2
Cheese, natural and processed	million kilograms	369	435	5
Milk, condensed, evaporated, and powdered	million kilograms	736	844	9
Ice cream	thousand hectoliters	55	62	
Fluid milk and by-products	million kilograms	1,661	1,693	1,7
Yogurt	thousand hectoliters	80	104	1
Cream, treated and sterilized	thousand hectoliters	99	104	1
Preserved fruits, vegetables, and specialty products				
Canned fruits and vegetables	thousand metric tons	291	345	4
Canned soup	million liters	294	316	4
Frozen fruits and vegetables	million kilograms	56	90	
Conserves and jellies	million kilograms	7	7	
Pickles and sauces	thousand metric tons	28	31	
Grain mill products				
Wheat products, flour, and meal	million kilograms	1,483	1,562	1,70
Oat products	million kilograms	11	11	1
Barley products	million kilograms	32	30	
Corn products	million kilograms	30	34	4
Rice products	million kilogram	3	5	
Breakfast cereals	million kilograms	20	24	
Poultry and livestock feeds	million kilograms	1,650	1,680	1,5
Bakery products				
Bread	thousand metric tons	598	611	6
Flour confectionery	thousand metric tons	47	51	6
Biscuits and crackers	thousand metric tons	156	160	17
Sugar and confectionery products				
Refinel sugar	million kilograms	850	821	80
Sucrose liquid sugar	million kilograms	293	305	33
Confectionery products	million kilograms	103	96	10
Chocolate products	million kilograms	35	28	2
Cocoa products	million kilograms	50	51	5
Fats and oils				
Vegetable and seed oils	million kilograms	325	319	
Fish and marine animal oils	million kilograms	72	91	10
Animal oils and fats	million kilograms	150	157	17
Oilseed cake and meal	million kilograms	327	342	36
Meat meal	million kilograms	190	201	22
Margarine and compound fat	million kilograms	232	254	29
Beverages				
Malt beverages	million liters	1,243	1,622	1,89
Spirits, aperatifs, and liqueurs	million liters (at 100%)	68	77	9
Soft drink concentrates and fruit juices	million liters	130	158	20

Continued on next pag

Table 6.—Netherlands: Output of major processed food products, 1975, 1980, and projected 1985—continued

ctor/product	Units	1975	1980	1985
Soft drinks[1]	million liters	869	993	1,075
Drink powders	thousand metric tons	3	4	5
Alcoholic cider	million liters	5	7	9
Wines	million liters	14	16	20
ish and seafoods				
Canned fish	thousand metric tons	2	3	4
Fresh,[2] frozen, and cured fish and seafood	thousand metric tons	97	112	140
iscellaneous food products				
Coffee	million kilograms	109	108	115
Tea	million kilograms	10	11	12
Nuts, prepared	million kilograms	34	36	40
Corn starch by-products	thousand metric tons	46	50	59
Glucose	thousand metric tons	94	121	140
Macaroni products	million kilograms	27	29	32
Yeast	thousand metric tons	34	37	42
Crisps and snacks	million kilograms	22	40	55

[1] Includes carbonated water.

[2] Only included where some processing has been involved.

Source: See source notation of table 1.

crease; in 1980, Dutch dairy products worth $2.3 llion were shipped not only to EEC customers ncluding Greece), but to the Middle East, Africa, d North and South America. Exports, which nounted to 55 percent of the sector's sales, are pected to climb about 3 percent a year. Both raw aterials supply and processing capacity are con- dered sufficient to meet any foreseeable increase in her export or domestic demand.

Dutch dairy managers have demonstrated their llingness to invest in up-to-date equipment. But ditional modernization and expansion are con- lered unlikely for the present, since the sector is ll adjusting to its new structure. Equipment ex- nditures, which dwarfed those of any other sector 1980, are forecast to rise a moderate 2.5 percent arly. The sector's purchases of processing equip- nt are foreseen growing from $112.1 million in 80 to $127.2 million in 1985. Processing tech- ques tend toward the known and conservative, ugh buyers express active interest in micro- cessor-controlled flowlines, process control, and cess monitoring for improved quality.

Sales of packaging equipment to the dairy prod- s processing sector are forecast to expand to rly $30 million in 1985. While milk cartons are l popular, the local firm, Stork Bepak, which sup- es 30 percent of milk bottling equipment, has ively (and successfully) promoted a return to ss bottles for fluid milk. Even yogurt is often sold glass bottles. Experts foresee a growing use of minum foil for cheese and for butter, both of ich are now mostly packaged in plastic tubs.

Preserved fruits, vegetables, and specialty products processing.—The 114 firms in Holland's thriving preserved fruit, vegetables, and specialty products sector typically process some 350,000 mt of vegetables and 150,000 mt of fruits and tomatoes each year. Vegetables were canned (47 percent), frozen (20 percent), pickled (15 percent), and dried (18 percent), while fruit was frozen or processed into sauces, syrups, juices, and preserves. Output of frozen fruits and vegetables is expected to grow nearly 60 percent from 1980 to 1985. In 1980, the sector's sales amounted to $743 million, including exports of $446 million.

Multinational corporations continue to dominate this sector. Unilever controls such processors as Lucas Aardenburg, De Betuwe, Iglo, Unox, and Royco. Groko, a subsidiary of International Telephone and Telegraph (ITT), is Iglo's principal competitor in the market for frozen fruits and vegetables. Other important manufacturers include Hak Conservenfabriek (a market leader in glass-packed fruit and vegetables), Nutricia, the Swiss-owned Hero Conserven Breda (strong in the fruit juice market), and the Dutch subsidiary of H. J. Heinz.

Dutch fruit and vegetable processors respond quickly to changes in consumer demand and raw material availability. Current research and development efforts focus on anticipating demands of local households and restaurateurs. The trend to consume more snacks has opened up a market for potato-based fast foods, while hot snacks encourage new combinations of soups and vegetables. Frozen vegetable and meat combinations are also popular.

Table 7.—Netherlands: Sales [1] of food packaging equipment by type of equipment, 1980 and projected 1985

(in thousands of U. S. dollars)

Type of equipment	1980	1985
Container forming equipment		
Thermoformers	5,350	6,524
Blow molders	2,000	2,450
Can-making machinery	2,325	2,850
Other	1,950	2,400
Subtotal	11,625	14,224
Container filling equipment		
Fillers for liquids	9,250	11,275
Fillers for viscous products	1850	2,250
Fillers for dry products	3,850	4,700
Fillers for solids	1,800	2,200
Subtotal	16,750	20,425
Container/package/case closing and/or sealing equipment		
Heat sealers	1,900	2,725
Can closers, sealers	5,500	6,700
Cappers, crimpers, hooders	5,000	6,100
Corking equipment	2,000	2,000
Gluing equipment	1,750	2,175
Tying, sewing, stapling equipment	1,500	1,900
Cutting, slitting, trimming equipment	750	850
Subtotal	18,400	22,450
Container form/fill/seal systems		
Vacuum and gas systems	13,500	16,500
Aerosol systems	1,060	1,300
Other systems	11,940	14,500
Subtotal	26,500	32,350
Product wrapping equipment		
Wrappers (direct, outer, overwrap)	4,600	5,600
Bundlers	3,200	3,950
Shrink wrappers and tunnels	6,050	7,400
Subtotal	13,850	16,950
Other wrapping equipment		
Pallet wrappers	2,900	3,550
Other	3,300	4,000
Subtotal	6,200	7,550
Packing equipment		
Cartoners	2,800	3,425
Multipackers	5,200	6,350
Other	1,250	1,525
Subtotal	9,250	11,300
Marking equipment		
Labelers	705	860
Can wrappers	500	600
Coding equipment	900	1,300
Imprinting, printing equipment	450	520
Other	645	720
Subtotal	3,200	4,000
Inspecting equipment		
Checkweighers, weighers, scales	1,500	1,[illegible]5
Inspectors, detectors, testers	2,250	2,[illegible]5
Subtotal	3,750	4,[illegible]0
Container/product/package preparation and handling equipment	5,948	2,[illegible]6
Total	115,473	136,[illegible]5

Continued in next column

[1] Values exclude duties, taxes, and distribution costs.

Source: See source notation of table 1.

Consumer demand has evolved for new and different fruit pie fillings. Recently, Dutch processors have been buying frozen blueberries from U.S. and Canadian sources for incorporation into snacks, pastries, and pancake mixes.

Despite stiff competition in export markets from Eastern European, French, and Italian processors, Holland's fruit and vegetable sector is confident of continued future growth. The sector's equipment spending ($34.7 million in 1980) is high relative to sales. Automation is widespread, with even the smallest enterprise looking to technologically advanced equipment. Digital computers control material flow, pressure, liquid level, density, temperature, and moisture. Recent refinements have included fluidized bed freezing and continual spiral tunnel freezing. Freeze drying is popular because it offers swift processing and good flavor retention. In [illegible] purchases of processing equipment by the fruit, vegetable, and specialty products sector are forecast to rise a healthy 5 percent per annum, to $17 million in 1985. Buyers are particularly interested in compact production lines, since Holland's high population density puts a premium on space and makes sprawling installations costly.

This is the only sector in the Dutch food industry to spend more on packaging equipment than processing equipment. Amounting to $21.5 million in 198[illegible], the sector's purchases of packaging machinery are projected to expand at a 5 percent annual rate, to nearly $28 million in 1985. Packaging improvements are centered on bottle sterilization, label coding, and container filling. Tinplate, glass, cartons, and foil are all widely used packaging materials. Glass is regaining its popularity for packaging sauces and jams.

Grain mill products processing.—The grain mill products sector, one of the least dynamic in the Netherlands, comprises just 18 firms and some 2,000 employees. Sales amounted to $548 million in 1980 and, in light of slack demand, are forecast to show little appreciable growth. Only production of breakfast cereals is expected to expand over the 1980-85 period.

Seven major producers — Meneba, Europese Graanhandel, Felix Cohen, Tarvo, Wessaneau Meel, Wijngarden, and Koopmans—account for over 60 percent of the market. Supplies of raw materials (mostly wheat, corn, barley, manioc, and sorghum) are stable and adequate.

Automation is considered long overdue by outside observers, but the static market gives millers little incentive to invest. Less than 2 percent of the sector's receipts were invested in food processing and packaging equipment in 1980. Projections for 1985 indicate a virtually unchanged level of spending on both categories of machinery. Purchases of processing equipment are projected at $9.5 million in 1985, up from $9.3 million in 1980. Expenditures on packaging machinery hover just above the $1 million mark, with an increase of only $30,000 foreseen to 1985. Milled flour is bulk packed in bags, while pet foods are commonly shipped in cans and plastic containers.

Bakery products processing.—As in most countries, the bakery sector in the Netherlands comprises many small establishments, though a few large enterprises account for most of the output. Only 378 of Holland's more than 3,500 bakeries employ over 10 people, and thus show up in official statistics. Output of these officially counted firms and their 18,742 workers amounted to $1.1 billion in 1980. The largest, Meneba, claims to bake over 32 percent of Holland's bread. Though far from this giant's stature, there are a number of other sizable bakers. These include Verkade, Biscuitfabriek Pat[illegible], Victoria, Hooimeijer, and Bottetje, as well as the in-house bakeries of such grocery chains as de Ruyter and Albert Heijden. Overrefinement of the bread offered by big bakeries has prompted many consumers to switch back to neighborhood bakers, who quickly respond to changing consumer tastes with a wide variety of cakes, rolls, and bread.

Production of both bread and flour confectionery is forecast to show significant growth over the 1980-85 period: 11 percent for bread; 22 percent for flour confectionery. Local demand still accounts for the overwhelming majority (over 92 percent) of sales, but exports of some items are picking up. In the United States, Dutch-baked rusks and cookies marketed through Nabisco are showing up on many supermarket shelves.

Automation in the sector is restricted to the six largest bakers; smaller establishments are reluctant to give up the flexibility provided by more labor-intensive methods. As bakers strive to succeed against other local rivals, small-scale specialty equipment is likely to prove salable. In all, the bakery sector is forecast to raise its purchases of processing equipment a respectable 3.7 percent a year to $17.3 million in 1985.

Table 8.—Netherlands: Consumption of packaging materials by the food processing industry, 1980

Packaging material	Quantity	Units
Aluminum caps	2,750	metric tons
Aluminum foil	6,000	metric tons
Aluminum cans	11,360	metric tons
Tinplate cans	122,500	metric tons
Steel drums	2,200	thousand U.S. dollars
Glass bottles and containers	1,350	million units
Fiberboard, corrugated	136,000	metric tons
Fiberboard, solid	15,000	metric tons
Cartons	59,750	metric tons
Kraft paper sacks	14,000	metric tons
Food wrapping paper	10,750	metric tons
Closures, miscellaneous	185	million units
Plastic bottles	3,000	metric tons
Plastic lids and caps	3,000	metric tons
Plastic flexible packing, monomer	19,000	metric tons
Plastic flexible packing, laminate	6,000	metric tons
Plastic drums	140,000	units
Plastic film, regenerated	6,000	metric tons
Plastic-metal tubes, collapsible	1,000	million units

Source: See source notation of table 1.

Demand for packaging equipment is sustained by the attention given to protecting baked goods and attractively presenting higher-priced breads and pastries. Sales of packaging machinery to the baked goods sector are projected at $10.2 million in 1985, up from $8.5 million in 1980. Bread is ordinarily packaged in waxed paper, polyethylene, and polypropylene tissue paper and cellophane are used for cakes; and aluminum foil packaging to enhance eye appeal is used for expensive items.

Sugar and confectionery products.—Processors of sugar and confectionery products employed about 12,280 workers in 82 establishments in 1980, selling output worth $1.2 billion. The increasingly health-conscious Dutch population is cutting back on consumption of sugar (currently almost 42 kg per capita) and sweets. And stiff competition from other EEC producers inhibits expansion of exports. As a result, refined sugar output fell from 1975 to 1980 and is forecast to decline still further by 1985. Even production of Holland's famed chocolate products is forecast to continue its slide, falling nearly 15 percent from 1980 to 1985.

Sugar refiners number just 10. The largest include

Marketing Practices

Foreign-built food processing and packaging equipment is most commonly sold in Holland through sales agents and importing distributors. Potential foreign suppliers have access to numerous competent Dutch agents with ties to all sectors of this geographically concentratd market. American vendors should take care (as their German rivals do) to ensure that agents are suitably trained and that they are supported with timely delivery, high quality products, good services, and Dutch language promotional material. Dutch food processors rarely buy directly from foreign manufacturers that do not operate a manufacturing plant or sales office in the Netherlands. Contractor construction of turnkey plants is somewhat more common, which may present American firms with opportunities to provide their technical expertise.

Holland is a quality-conscious market where reliable equipment performance and vendor service (such as punctual delivery, favorable warranty provisions, and sufficient after-sales service capability) are a must. To the Dutch food processor, minimal downtime and ease of maintenance count more than credit and payment terms, which in turn are more important than price. Although price is a secondary consideration, the intense competition among the numerous foreign and domestic suppliers tends to keep margins down. Mark-ups typically range from 80 to 120 percent of landed price, excluding import duties and the across-the-board value added tax (VAT). Normal promotional techniques include product exposure at Dutch or other nearby foreign exhibitions; trade media advertising; informative, attractive product literature distributed through agents or importers; and direct mail product information campaigns.

Trade and Technical Regulations

Duties on food processing and packaging equipment imported into the Netherlands from outside the EEC generally range from 4.3 to 8.6 percent ad valorem. Tariffs are higher only for electric measuring instruments, ranging from 6.3 to 12.8 percent. Shipments from EEC countries enter duty free. All goods sold in Holland, whether foreign or locally built, are subject to the 18 percent VAT. No nontariff barriers hamper market entry of U.S.-built equipment.

American and German standards are readil accepted for most food processing and packagin equipment. Only in a few areas are local standard applied, and these are increasingly giving way t EEC-wide standards. Details on special standard applicable only to food packaging equipment sol in the Netherlands are available (in English) from Nederlands Normalisatie Instituut, Kalfjeslaan 2 Delft.

Additional Information

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AMPAIGN

The market for medical equipment in the Netherlands is forecast to rise from nearly $140 million[1] in 1980 to $170 million in 1985, representing an average annual growth rate of 4 percent (see table 1), significantly less than in the early 1970's when health care costs expanded steeply. With a change in Government to the center-right coalition of Prime Minister Ruud Lubbers in the Fall of 1982, budgetary restrictions were instituted and two new laws passed to reinforce the Government's efforts to exercise control over health care costs. The Health Services Act and the Health Care Charges Act will be implemented over the next years—bringing more local and provincial control over medical facilities, eliminating duplication of institutions and services, and reviewing insurance payments and contributions to cover medical services.

Nevertheless the Dutch market, and particularly the import market, remains among the largest in the world. Demand is expected to focus on sophisticated and efficient medical systems and devices that will help to reduce labor costs. As the use of such equipment has spread, users have increasingly become interested in multisample, multiparameter computer-based systems, especially on a turnkey basis.

Imports of medical equipment are expected to grow an average 5 percent annually rising from $222 million in 1980 to $280 million in 1985 in constant prices. More than half the equipment imported is reworked and reexported. In fact, U.S. official trade statistics from the Bureau of the Census show consistently larger exports to the Netherlands than those recorded as imports from the U.S. in Dutch Trade Statistics—reflecting substantial reexports and entrepot trade (see tables 2, 3 and 4). U.S. companies captured 30.5 percent of the import market in 1982, surpassing West German competitors for the first time. They are leading suppliers of electroencephalographs, renal dialysis equipment, electrosurgical equipment, ophthalmic apparatus and instruments, cardiac stimulators, and orthopedic apparatus. U.S. exporters of medical components and semi-manufactured devices should also continue to find increasing demand from domestic manufacturers.

Competitive Assessment

In 1978, Dutch medical equipment manufacturers, which employed approximately 4,000 people, produced about $300 million worth of equipment. Of the 16 major domestic companies, Philips dominates production, accounting for roughly half the total output and employing half the labor force in the industry. Philips manufactures a wide range of electromedical, diagnostic, and therapeutic equipment. Other important domestic producers of medical equipment include Enraf Nonius, Vitatron, C Europa, Cordis, Gould-Godart and Medtronic (the l three are U.S. subsidiaries).

X-ray equipment makes up more than half of medical equipment produced by Dutch companies a about half of all equipment that is export Production of specialized (e.g., cardiovascul neurological, tomographic) X-ray equipment is creasing. Domestic firms also manufacture diagnos ultrasound equipment, lung function equipment (es cially microprocessor-controlled wet and dry spiro ters and automated diffusion and compliance measu ment equipment), generators, image intensifie cameras, and monitors.

The Netherlands has become a major center for manufacture of pacemakers, especially lightwei implantable units. Dutch companies also ma external pacemakers and equipment for testi pacemakers performance. Other devices and syste produced locally include intensive care unit syste and such physiotherapy equipment as electri stimulation units and diathermy systems.

Increasing competition from foreign suppliers, a in some cases from domestic manufacturers particular product lines, has prompted Philips to ad a development strategy that entails the creation of jo ventures to launch new products. For instance, Phil new medical electronics company, formed w Honeywell, is reportedly the largest of its kind Europe.

The medical equipment industry spends between 7 and 10 percent of annual turnover on the developm of new equipment. Areas of product developm receiving current attention include noninvasive agnostic technology, especially ultrasound and nuc

Table 1. — Netherlands: Estimated market for medical equipm by application areas, 1979-82 and projected 1985
(in millions of U.S. dollars)

	1979	1980	1981	1982	19
Cardiology equipment	6.8	7.0	7.2	7.5	
Pulmonary apparatus	5.4	5.5	5.5	5.5	
Neurological equipment	4.0	4.0	4.0	4.0	
Ophthalmological equipment	9.6	9.9	10.0	10.1	
Pediatric equipment	8.5	8.7	8.5	8.6	
Renal equipment	2.3	2.4	2.5	2.6	
Operating room equipment	19.3	19.8	20.7	21.0	2
General hospital equipment	16.2	16.4	16.9	17.3	1
Clinincal laboratory equipment	5.3	5.4	5.6	5.8	
Miscellaneous health care equipment	11.6	12.1	12.6	12.7	1
Disposables	11.3	12.3	13.6	14.2	1
Orthotic and prosthetic equipment	4.9	5.0	5.2	5.3	
Architectural, transport, and mobility equipment	9.6	10.1	10.3	10.4	1
Physical and occupational therapy equipment	11.9	12.4	12.8	13.1	1
Sensory aids and adaptive systems	8.3	8.6	8.6	8.9	1
Total	135.0	139.6	144.0	147.0	17

Source: International Trade Administration, Office of Trade Information Serv research study (see Additional Information box).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = f2.16 (1978), f1.99 (1979), and f1.99 (1980 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 2. — Netherlands: Exports of medical equipment from the United States, 1978-82
(in thousands of U.S. dollars)

	1978	1979	1980	1981	1982	Percentage change 1978-82	1981-82
ledical instruments							
Pacemakers	13,138	9,586	11,567	10,907	9,873	–24.8	–9.4
Diathermy units	5	—	8	1	3	–39.9	200.0
Ultrasonic therapeutic devices	421	317	267	232	146	–65.3	–37.0
Other therapeutic apparatus	6,878	15,261	18,132	19,875	19,659	185.8	–1.0
Electrocardiographs	334	446	212	461	657	96.7	42.5
Electroencephalographs	41	124	24	64	44	7.3	–31.2
Complete patient monitoring systems	1,368	1,861	2,639	2,122	3,259	138.2	53.5
Electromedical apparatus, NSPF	27,807	25,680	20,590	30,112	31,067	11.7	3.1
Electromedical apparatus parts	3,396	8,793	9,260	7,523	7,955	134.2	5.7
X-ray tubes	41	48	24	161	35	–14.6	–78.2
Parts for X-ray tubes	13	9	4	58	45	246.1	–22.4
X-ray apparatus & parts for medical or dental use	3,226	4,141	5,990	6,871	6,335	96.3	–7.7
Radiological apparatus & parts for medical or dental use	837	220	514	1,602	605	–27.7	–62.2
Ophthalmic instruments & appliances & parts	313	429	354	745	429	37.0	–42.4
Anesthetic apparatus & instr. & pts. (exc. syringes)	318	218	270	176	280	–11.9	59.0
Bougies, catheters, drains, & sounds & parts	3,212	5,190	4,545	5,249	8,849	175.5	68.5
Basal metabolism & blood pressure apparatus, & parts	1,386	2,454	2,507	3,631	7,418	435.2	104.3
Hypodermic syringes, & parts	279	207	646	519	663	137.6	27.7
Other syringes, & parts, NSPF	90	148	270	89	153	70.0	71.9
Other medical, etc. instruments & apparatus, & parts, NSPF	6,725	8,048	8,559	13,246	9,303	38.3	–29.7
Subtotal	69,828	83,180	86,382	103,644	106,778	52.9	3.0
ledical and hospital appliances and equipment							
Sterilizers & autoclaves & parts	46	91	246	40	180	291.3	350.0
Wheelchairs, & parts	84	29	83	29	96	14.2	231.0
Other hospital, medical, dental, etc. furniture, NSPF	602	404	1,334	2,190	2,119	251.9	–3.2
Mechanotherapy appliances & massage apparatus, & parts	410	651	373	337	372	–9.2	10.3
Artificial respiration, ozone, oxygen, aerosol therapy etc.[1]	2,214	1,789	1,828	—	—		
Artificial respiration, NSPF	—	—	—	1,776	2,018		13.6
Hearing aids & parts, NSPF	383	281	561	512	553	44.3	8.0
Bone & joint prosthesis, plates, screws, nails, etc.	407	379	411	546	1,079	165.1	97.6
Other orthopedic appliances	824	885	1,719	1,476	2,476	200.4	67.7
Subtotal	4,970	4,509	6,555	6,906	8,893	78.9	28.7
ledical supplies							
Opacifying prep. for radiological exam.	73	93	75	181	209	186.3	15.4
Other diagnostic agents (exc. biological) NSPF	658	932	525	560	1,169	77.6	108.7
Waddings, gauze, dressings, etc. w/medicinals	123	44	111	100	252	104.8	152.0
Other waddings etc. NSPF	1,021	1,778	2,218	2,182	2,155	111.0	–1.2
Surgical sutures & materials etc., sterile	3,405	2,378	5,023	7,822	7,742	127.3	–1.0
Surgical and medical gloves	491	1,549	922	907	1,039	111.6	14.5
Hypodermic needles	8	120	130	37	490	6,025.0	1,224.3
X-ray film, medical, exc. dental	2,676	2,431	2,984	1,743	975	–63.5	–44.0
Other X-ray film	249	133	246	319	308	23.6	–3.4
Contact, ophthalmic lenses not mounted	198	404	562	519	329	66.1	–36.6
Other ophthalmic lenses	890	1,096	1,137	1,868	2,029	127.9	8.6
Eyeglass, etc. frames, mountings & parts[2]	425	—	—	—	—		
Eyeglass fronts & temples	—	634	237	154	3		–98.0
Parts, NSPF, for eyeglasses, lorgnettes, goggles, etc.	—	72	52	45	30		–33.3
Subtotal	10,217	11,664	14,222	16,437	16,730	63.7	1.7
Total	85,011	99,353	107,158	126,988	132,400	55.7	4.2

[1] Product category was subdivided in 1981, with gas masks for aviation purposes going into a separate statistical category no longer part of the medical group, and artificial spiration remaining (Sch. B 709 4540).

[2] Product category was subdivided in 1979 into the two product categories on the next two lines.

Source: Compiled from official statistics of the U.S. Department of Commerce, Bureau of the Census. Minor discrepancies in totals are due to rounding.

r magnetic resonance; the miniaturization of implantble devices; and the use of microprocessors in quipment to provide checking, calibration, and rocessing functions.

The larger part of Dutch-made medical equipment exported, owing in part to the products manufacured by Philips for sale outside the country. The successful export activities of Dutch companies are attributed to the high quality and reliability that end users associate with Dutch products. In addition, the Netherlands' high labor costs have tended to deter the creation of subsidiaries in the country, and this fact, coupled with the country's excellent air and sea links, has led to a burgeoning reexport trade.

Table 3. — Netherlands: Imports of medical equipment by country of origin, 1977-80 and projected 1985
(in millions of U.S. dollars)

	1977	1978	1979	1980	1985
Medical/Surgical electromedical diagnostic and ophthalmic apparatus (90.17)					
United States	23.67	32.37	45.77	49.63	65.0
Germany	19.51	35.21	35.66	34.76	
Japan	3.60	6.90	11.26	15.98	
United Kingdom	4.40	4.93	6.76	8.18	
Sweden	5.92	6.17	4.69	7.74	
Belgium-Luxembourg	—	—	—	6.92	
Switzerland	1.17	2.45	1.67	6.33	
Denmark	1.42	2.07	2.98	2.77	
Ireland	.71	.99	1.66	2.53	
Italy	—	—	—	.52	
Canada	—	—	—	.15	
France	.38	.66	.82	.13	
Singapore	—	—	—	.06	
Israel	.58	.85	.64	—	
Other	12.31	18.84	24.62	20.89	
Total	73.67	111.43	136.53	156.57	199.0
Selected subcategories:					
Electrocardiographs (90.17.01)					
United States	.38	.92	1.21	1.26	
Germany	.43	.53	.80	1.84	
United Kingdom	.17	.12	.23	.34	
Switzerland	.61	1.67	.60	.49	
Israel	.19	.07	—	—	
Other	.32	.43	.49	.71	
Total	2.09	3.74	3.32	4.64	
Electroencephalographs (90.17.05)					
United States	5.20	8.40	15.87	20.88	
Japan	.53	1.86	6.97	13.42	
Germany	1.89	3.35	5.52	8.72	
Sweden	1.37	1.77	2.14	3.17	
United Kingdom	.68	.69	1.25	2.40	
Switzerland	.56	.78	1.07	3.75	
Other	1.22	1.68	3.18	6.23	
Total	11.44	18.52	36.00	58.56	
Renal dialysis equipment (90.17.11)[1]					
United Kingdom	(1)	(1)	(1)	7.77	
Sweden				1.34	
Belgium-Luxembourg				.96	
Germany				.51	
United Kingdom				.20	
Italy				—	
Other				.42	
Total				11.19	
Ultraviolet or combined ultraviolet and infrared ray apparatus (90.17.13)					
United States	.07	—	—	.05	
Germany	2.18	8.90	3.07	3.87	
Sweden	.02	—	.51	.73	
United Kingdom	.10	.03	—	—	
Other	.07	.13	.26	.53	
Total	2.44	9.05	3.83	5.18	
Diathermy and ultrasonic equipment (90.17.16)					
United States	.89	.16	.34	.44	
Germany	.50	.72	.75	.73	
France	—	.05	—	—	
Other	.01	.15	.08	.03	
Total	1.40	1.07	1.18	1.19	
Other diathermy equipment (90.17.170)					
United States	.08	—	—	.06	
Germany	.37	.54	.65	.72	
Other	.04	.06	.35	.33	
Total	.48	.60	1.00	1.12	
Equipment for electrosurgery (90.17.21)[2]					
United States	5.29	8.82	9.26	(2)	
Germany	3.99	4.95	7.30	—	
United Kingdom	.69	.73	1.27	—	
Japan	.63	1.03	1.24	—	
Denmark	.24	.42	.69	—	
Israel	.39	.78	.64	—	
France	.20	.32	.21	—	
Other	.73	1.78	2.59	—	
Total	12.15	18.84	23.21	—	
Anesthetic equipment (90.17.40)					
United States	.02	.05	—	.05	
Germany	.09	.04	.19	.59	
United Kingdom	.04	.11	.17	.25	
Sweden	.09	.10	—	—	
Other	.02	.05	.09	.18	
Total	.27	.34	.44	1.07	
Special instruments for diagnosis except electrodiagnosis (90.17.50)[3]					
United States	1.01	2.36	2.77	(3)	
Germany	1.21	1.32	1.57		
United Kingdom	.35	.17	.38		
France	.18	.29	.61		
Japan	1.08	1.32	1.28		
Other	.31	1.00	.97		
Total	4.15	6.46	7.58		
Needles and other small surgical instruments (90.17.90)[4]					
United States	10.38	11.04	15.76	(4)	
Germany	7.56	13.35	15.62		
United Kingdom	1.91	2.75	3.27		
Sweden	4.44	4.31	2.50		
Denmark	.89	1.36	1.91		
Japan	1.19	2.56	1.74		
Other	7.60	10.02	12.26		
Total	33.96	45.38	53.05		
Ophthalmic apparatus and instruments, other (90.17.99)[5]					
United States	(5)	(5)	(5)	12.82	
Germany				10.74	
United Kingdom				3.81	
Denmark				1.56	
Sweden				1.80	
Switzerland				1.84	
Other				11.01	
Total				43.59	
Mechanotherapy appliances, artificial respiration apparatus (90.18)					
United States	.64	.89	1.08	1.45	1.7
Germany	2.43	3.38	6.88	8.03	
United Kingdom	1.24	.97	.98	1.50	
Canada	1.61	2.92	.43	—	
Hong Kong	.27	.37	.33	.39	
Sweden	.38	.60	.32	.47	
Denmark	.38	.36	.25	.23	
Japan	.08	.09	.12	.07	
Norway	.04	.04	—	.03	
Other	1.16	1.59	1.57	1.68	
Total	8.23	11.20	11.96	13.85	17.5

Table 3. — Netherlands: Imports of medical equipment by country of origin, 1977-80 and projected 1985 — continued
(in millions of U.S. dollars)

	1977	1978	1979	1980	1985
cted subcategories:					
er mechano-therapy or massage quipment (90.18.19)[6]					
United States	.10	.16	.45	.72	
Germany	.15	.25	.33	.78	
United Kingdom	.12	.09	.14	.28	
Denmark	.29	—	.05	.11	
Norway	.04	.04	—	.03	
Other	.22	.30	.51	.19	
Total	.92	.83	1.48	2.11	
dical respirators (90.18.50)[7]					
United States	.31	.47	.38	.43	
Germany	1.79	2.55	6.09	5.81	
United Kingdom	.99	.74	.69	1.04	
Canada	1.61	2.92	.43	—	
Sweden	.31	.50	.25	.33	
Other	.83	.90	.74	1.06	
Total	5.84	8.07	8.58	8.67	
sthetic and orthopedic apparatus earing aids and apparatus for ractures (90.19)					
United States	30.22	38.59	29.19	34.73	40.5
Germany	2.76	3.89	4.82	4.90	
Ireland	1.17	1.43	1.85	1.07	
Denmark	.90	1.28	1.58	1.61	
United Kingdom	3.05	1.00	1.33	1.70	
Sweden	.42	.58	1.10	1.09	
Belgium-Luxembourg	.76	.59	.94	.51	
Switzerland	.73	.66	.57	.76	
France	.45	.46	.32	.91	
Canada	.67	.37	.13	.04	
Austria	.10	.08	.11	.12	
Israel	.07	—	—	—	
Brazil	.03	—	—	—	
Other	.82	1.86	3.10	3.23	
Total	42.15	50.79	45.04	50.69	64.3
lected subcategories:					
her articles and apparatus for artificial limbs not specified elsewhere (90.19.25)					
United States	1.13	2.44	1.89	3.06	
Germany	1.19	2.04	2.74	2.49	
Ireland	.80	1.02	1.26	.86	
United Kingdom	.61	.62	.75	.90	
Belgium-Luxembourg	.53	.41	.52	.36	
Other	.01	.82	1.07	1.48	
Total	4.26	7.33	8.23	9.15	
aring aids (90.19.31)					
United States	—	.08	.14	—	
Denmark	.80	1.13	1.43	1.41	
Austria	.10	.08	.11	.12	
Germany	.15	.31	.06	.55	
Brazil	.03	—	—	—	
Other	.04	.11	.31	.38	
Total	1.12	1.70	2.05	2.46	
rdiac stimulators (90.19.51)					
United States	17.65	23.71	15.26	19.76	
Germany	.63	.93	1.27	.89	
Sweden	.38	.51	1.00	.98	
France	.43	.46	.29	.81	
Canada	.67	.37	.13	.04	
United Kingdom	.33	.09	.10	.17	
Other	.23	.49	.76	.40	
Total	20.32	26.57	18.80	23.04	

	1977	1978	1979	1980	1985
Other handheld, portable or implanted apparatus; parts and accesories for cardiac stimulators (90.19.55)					
United States	11.01	11.54	11.03	10.53	
Sweden	.04	.07	.11	.11	
United Kingdom	1.90	.04	.04	.05	
Belgium-Luxembourg	.07	—	—	—	
Israel	.07	—	—	—	
Other	.05	.13	.32	.36	
Total	13.14	11.79	11.50	11.05	
Orthopedic apparatus (90.19.91)					
United States	.22	.38	.68	1.05	
Germany	.52	.47	.53	.61	
United Kingdom	.22	.25	.45	.59	
France	.02	—	.03	.11	
Other	.03	.05	.04	.25	
Total	1.02	1.14	1.72	2.61	
Splints and other equipment for treating fractures (90.19.95)					
United States	.13	.33	.13	.28	
Ireland	.38	.42	.60	.21	
Switzerland	.73	.66	.57	.76	
Germany	.18	.15	.23	.30	
Belgium-Luxembourg	.06	.07	—	—	
Other	.17	.19	.33	.33	
Total	1.64	1.80	1.85	1.88	
Apparatus based on X-rays or radiations from radioactive substances (90.20)					
United States	4.95	6.55	7.69	7.09	8.7
Germany	19.02	27.13	30.66	40.20	
Italy	2.83	4.61	7.14	6.16	
France	2.93	3.87	4.66	5.36	
Sweden	2.05	2.00	2.36	2.37	
Japan	.70	1.13	1.58	.74	
United Kingdom	3.93	1.88	.93	4.58	
Switzerland	.14	.21	.22	.19	
Austria	.07	.03	—	—	
Israel	.06	—	—	—	
Other	7.59	12.91	15.78	19.02	
Total	44.25	60.30	71.01	85.72	108.5
Selected subcategories:					
X-ray apparatus (90.20.11)					
United States	3.43	4.51	5.08	3.60	
Germany	9.88	12.57	14.36	21.63	
Italy	.95	.67	2.66	2.53	
Japan	.67	1.13	1.58	.74	
United Kingdom	2.84	.76	.21	.41	
Other	4.81	7.12	8.13	9.55	
Total	22.58	26.75	32.01	38.46	
X-ray tubes (90.20.71)					
United States	.68	.24	.34	.28	
Germany	3.55	4.38	4.73	6.47	
France	1.69	2.79	3.42	4.36	
Switzerland	.14	.21	.22	.19	
Italy	.76	.64	.07	.09	
Austria	.07	.03	—	—	
Other	.40	.93	1.21	1.16	
Total	7.29	9.21	9.99	12.55	

Table 3. — Netherlands: Imports of medical equipment by country of origin, 1977-80 and projected 1985 — continued
(in millions of U.S. dollars)

	1977	1978	1979	1980	1985
Other parts and accessories for X-ray equipment (90.20.99)					
United States	.69	1.34	1.94	2.69	
Germany	5.45	8.87	11.04	11.72	
Italy	1.12	3.31	4.41	3.54	
Sweden	2.05	2.00	2.36	2.37	
France	1.24	1.08	1.24	1.00	
United Kingdom	.87	.60	.73	3.28	
Other	2.31	4.72	6.03	7.61	
Total	13.72	21.91	27.75	32.21	

	1977	1978	1979	1980	198
Instruments and apparatus for physical or chemical analysts (90.25)					
United States	1.14	1.70	3.02	2.38	3.
Germany	3.28	4.28	2.45	4.70	
United Kingdom	.73	.67	1.13	1.75	
Switzerland	.13	.12	.37	.29	
Sweden	.24	.23	.26	.26	
Japan	.19	.07	.12	.09	
France	.04	.14	.09	.23	
Austria	.09	.05	—	—	
Other	2.59	1.56	1.22	1.24	
Total	5.70	8.65	8.46	11.47	14.

[1] Included in 90.17.21 prior to 1980.
[2] Divided in 1980 among 90.17.11, –.23, –.99, –.07, –.09.
[3] Included in 1980 in 90.17.99.
[4] Divided in 1980 among 90.17.32, –.34, –.51, –.59, –.99.
[5] Included prior to 1980 under 90.17.21, –.50, –.90.
[6] Became 90.18.29 in 1980.

Note: the statistical code used in this table is the Customs Cooperation Coun Nomenclature (CCCN) formerly known as the Brussels Tariff Nomenclature (BT generally used for international trade statistics, along with the Standard Internatio Trade Classification (SITC) Nomenclature.

[7] Became 90.18.59 in 1980.
Source: Netherlands Central Office of Statistics.

The Dutch Government supports innovation in the medical field, in part through its organization for technical research, and also provides technical support to small and medium-sized companies. Both types of assistance give domestic manufacturers of medical equipment an advantage over foreign suppliers. Government purchasing policy also favors domestic companies, especially those producing new or sophisticated equipment. Nonetheless, trade sources maintain that the Government does not discriminate against foreign equipment suppliers and does not employ nontariff trade barriers. In the final analysis, success in the Dutch market belongs to those manufacturers that adopt aggressive marketing approaches and offer sophisticated product lines.

Competition from third-country suppliers, especially those based in EEC countries, remains strong. Siemens (Germany) and CGR (France) both vie wit Philips in the supply of general hospital equipmen and by 1985 competition from Japanese manufacture is expected to increase at the expense of Europea suppliers.

Of the third-country suppliers, German firms hol the largest share of the import market (see table 3). I 1980, they sold $83 million worth of medica equipment, supplying nearly half of all importe X-ray equipment and capturing 26 percent of th import market. British firms furnished 5.6 percent o the imports that year; Swedish companies, 3. percent; Swiss suppliers, 2.4 percent; and Japanes manufacturers, 5.3 percent.

In 1980, purchases of U.S.-made medical equip ment were almost $64 million, accounting for nearl 29 percent of all imports (see table 4). U.S. companie

Table 4. — Netherlands: Estimated imports of medical equipment by application areas, 1979, 1980, and projected 1985
(in millions of U.S. dollars)

	1979		1980		1985	
	Imports	From U.S	Imports	From U.S.	Imports	From U.S.
Cardiology equipment	28.2	19.6	31.0	21.1	45	28.9
Pulmonary apparatus	6.9	1.7	7.8	1.8	9	2.4
Neurological equipment	6.4	1.5	7.1	1.6	9	1.8
Ophthalmological equipment	10.6	2.2	11.8	2.4	15	3.3
Pediatric equipment	5.7	1.4	6.3	1.5	8	2.0
Renal equipment	10.7	7.0	11.8	7.3	14	9.2
Operating room equipment	35.4	8.8	39.0	8.1	47	10.2
General hospital equipment	43.1	7.0	47.1	7.0	57	8.8
Clinical laboratory equipment	10.5	3.0	11.6	2.9	15	3.4
Miscellaneous health care equipment	14.0	2.9	15.7	3.0	19	4.0
Disposables	3.4	0.4	4.0	0.4	6	.7
Orthotic and prosthetic equipment	4.4	2.0	4.7	2.2	6	2.9
Architectural, transport, and mobility equipment	5.5	0.8	6.4	0.9	8	1.2
Physical and occupational therapy equipment	12.2	3.4	13.3	3.4	16	4.2
Sensory aids and adaptive systems	4.0	0.3	4.4	0.3	5	.4
Total	201.0	62.0	222.0	63.9	279	83.9

Source: International Trade Administration, Office of Trade Information Services research study.

pplied the largest share of imported medical/surgil, electromedical, and diagnostic equipment. Deite tightening of hospital medical equipment budgets the Government, U.S. exports of medical and spital appliances and equipment, including thopedic devices increased 28.7 percent from 1981 1982 while medical instruments, including elec-medical devices increased 3 percent. Imports from .S. suppliers are projected to rise at an average nual rate of 5.6 percent, reaching nearly $84 million 1985.

U.S.-made equipment enjoys a fine reputation nong Dutch end users thanks to its high technical d performance standards. In particular, equipment at offers data handling or computing capabilities is sured of a leading position in the marketplace.

Specific Product Markets

Cardiological equipment.—Because of concern out cardiovascular disease in the Netherlands, the e of cardiological equipment is expected to grow eadily, with demand focusing on such diagnostic stems as cardiac monitors aand echocardiographs ee Most Salable Products box). Domestic sales of rdiological equipment are predicted to increase from million in 1980 to $8.5 million in 1985. Imports, hich totaled $31 million in 1980, are forecast to ceed $45 million in 1985.

Purchases from U.S. companies, which account for etter than 60 percent of this market segment, are pected to grow by 6.5 percent annually, rising from 1 million in 1980 to nearly $29 million in 1985. .S. firms supplying cardiological equipment include edtronic and Hewlett Packard. Of the third-country anufacturers active in the market, Elema (Sweden) d Hitachi (Japan) supply cardiac monitors, Hellige ermany) and Siemens offer intensive care systems, d Simonsen and Weel (Denmark) makes defibrillars and electrocardiographs (ECG's). In 1980, nearly million worth of ECG's were supplied by U.S., erman, British, and Swiss manufacturers together. omestically, Medtronic BV makes cardiac pulse nerators and associated systems and components, d Cordis Europa specializes in cardiovascular struments and systems.

Pulmonary apparatus.—The pulmonary equipent market is forecast at $6 million in 1985. Imports, hich stood at nearly $8 million in 1980, are predicted exceed $9 million in 1985, with U.S. companies counting for about a quarter of sales. Manufacturers tive in the market include Gould-Godart (the etherlands), which produces lung function measureent equipment, and Draeger (Germany), which pplies a range of pulmonary equipment, including eathing apparatus.

Neurological equipment.—The market for neurogical equipment, which stood at $4 million in 1980, projected to increase to only $4.2 million in 1985. U.S. companies are expected to supply nearly $2 million of the $8.5 million worth of imported equipment in 1985.

Ophthalmological equipment.—The market for ophthalmological equipment is projected to grow by nearly 3 percent annually, exceeding $11 million in 1985. Purchases from foreign suppliers should top $15 million in 1985, with U.S. companies accounting for about one-fifth of all imports. The German company Zeiss is active in this market segment, and the U.S. firm Coherent Radiation supplies laser ophthalmic products.

Pediatric equipment.—Sales of pediatric equipment are forecast to increase only marginally over their 1980 level, reaching $9 million in 1985, while imports should grow to nearly $8 million, with U.S. manufacturers accounting for about one-quarter of sales. The Swedish firm Aga Medical supplies incubators.

Renal equipment.—The market for renal equipment is projected to grow annually by 4.6 percent, reaching $3 million by 1985. On the other hand, imports are forecast to increase to more than $14 million. Purchases from U.S. companies in 1985 are expected to top $9 million, up about 26 percent from the 1980 level of $7 million. Moderate growth is expected in the demand for mobile renal dialysis equipment suitable for home use.

Operating room equipment.—An annual growth rate of 5 percent is predicted for sales of operating room equipment through 1985. The market is projected to climb from nearly $20 million in 1980 to more than $25 million in 1985. In 1980, purchases of foreign-made equipment totaled $39 million, and in 1985 imports are forecast to reach almost $47 million, of which U.S.-made products should account for more than $10 million.

Companies active in this market segment include Enraf Nonius, Siemens, and Martin Loth (Germany), and Aga Medical, which supplies heart-lung machines. U.S. firms include Coherent Radiation, Sherwood Medical (catheters), and Squibb (ostomy products).

General hospital equipment.—Purchases of general hospital equipment are forecast to rise from more than $16 million in 1980 to $19.5 million in 1985. Imports are expected to account for nearly $60 million worth of sales in 1985, with U.S.-made products making up 15 percent or almost $9 million.

Philips, whose major manufacturing activity centers on X-ray equipment, remains an important source of general hospital equipment. Diagnostic ultrasound systems and computer-controlled diagnostic equipment constitute important items in Philips' product range, and the company also supplies various types of radiation-therapy systems. Other Dutch companies active in the market include Enraf Nonius (X-ray diagnostic equipment) and Oldelft (radiation therapy treatment planning systems).

German manufacturers dominate the import market for X-ray equipment. In 1980, for instance, 56 percent of all imported X-ray apparatus, 51 percent of all imported X-ray tubes, and 36 percent of all imported X-ray equipment parts and accessories came from Germany. X-ray equipment is also supplied by U.S., British, Japanese, Italian, French, Swiss, Swedish, and Israeli companies.

In addition to X-ray equipment, the German firms Siemens and Hellige supply patient monitoring systems, as does the British company Cambridge Instruments. The Japanese manufacturer Brethren Corporation provides diagnostic equipment, and CGR of France X-ray equipment and systems.

Several U.S. companies sell general hospital equipment in the Netherlands: Picker (gamma cameras and other nuclear medicine equipment); Hewlett Packard (patient monitoring systems); Ohio Nuclear (X-ray scanners and nuclear medicine equipment); G.D. Searle (scintillation counters, gamma cameras, and diagnostic ultrasound systems); General Electric (X-ray scanners); and Unirad (diagnostic ultrasound equipment).

Clinical laboratory equipment.—The growing concern for efficiency in clinical laboratory work has led to the use of more sophisticated, integrated equipment. As a result, the greatest demand is expected to focus on computer-based systems for sample analysis, cell counting, and on-line monitoring.

The market for clinical laboratory equipment is predicted to grow by about 4 percent annually to almost $7 million in 1985, with imports increasing to just over $15 million. In 1980, German companies accounted for about 40 percent of all imports, while U.S. firms followed with about 25 percent or nearly $4 million.

Digital Equipment Corporation, which makes laboratory computers, and Coulter, which makes automatic blood-cell counters and hematology systems are well known U.S. firms in this market. Third-country suppliers include the British companies Cambridge Instruments (ultramicrotomes) and Watson-Marlowe (infusion pumps), the Swedish firm LKB (enzyme analyzers), the Danish manufacturer Radiometer (blood gas analyzers), and the German firms Boehringer Mannheim (clinical analyzers) and Zeiss (microscopes and slide preparation equipment). Locally, Gould-Godart makes blood-gas analyzers and hemodialyzers.

Miscellaneous health care equipment.—The market for miscellaneous health care equipment is forecast to increase to nearly $15 million in 1985, with imports rising to more than $19 million. U.S. firms, which supplied $3 million worth of equipment in 1980, are expected to increase their share of sales to $4 million in 1985. The Dutch company Oldelft supplies high-resolution X-ray camera for mass chest survey one of its major products for the medical equipme market. At present, X-ray screening of employees carried out by major Dutch companies on a regul basis, and insurance companies are expected require such screening before issuing policies. As result, the demand for X-ray units to be used screening centers is predicted to grow, as is the nee for data handling systems to improve the efficient us of the diagnostic equipment.

Disposables.—The disposable market has unde gone significant expansion and is expected to continu to increase as textiles are steadily displaced by pape cellular, and other nonwoven products. This mark segment is forecast to experience the highest growt rate of any medical equipment category—nearly percent annually. Sales are predicted to climb to $1 million by 1985, with imports accounting for $ million. Purchases of U.S.-made equipment a expected to rise to $700,000 during this period.

Several companies supply disposables: Becto Dickinson, American Hospital Supply, Johnson an Johnson, and Sherwood Medical. In addition, dispos ables are produced locally by Kimberley-Clark an Needles Industries (United Kingdom) and 3M Nede land (the Netherlands).

Orthotic and prosthetic equipment.—The mark for orthotic and prosthetic equipment is expected increase to just over $6 million in 1985, with impor continuing to satisfy larger part of demand throug 1985, when sales by U.S. firms also are expected approach $3 million.

Orthotic and prosthetic equipment is imported fro companies in many countries: the United State Germany, the United Kingdom, Denmark, Belgium Luxembourg, Sweden, France, and Ireland. U.S manufacturers supply about half of all foreign-mad apparatus and hold a considerable share of the mark for pacemakers. The Dutch company Vitatron Medi cal produces pacemakers and the British firm Down Surgical supplies orthopedic implants.

Architectural, transportation, and mobilit equipment.—Sales of architectural, transportation and mobility equipment are predicted at almost $1 million in 1985. The corresponding level of imports likely to be close to $8 million in 1985. U.S. firms ar expected to increase their share of the mark marginally, selling more than $1 million worth equipment at that point.

Several U.S. companies are active in this mark segment. Everest and Jennings supplies wheelchair and other mobility equipment, Kypor Industrial make mobility equipment, American Stair Glide sells lift and lifting equipment for the handicapped, an Hill-Rom wheelchairs.

Physical and occupational therapy equipment.— The market for physical and occupational therap uipment is expected to increase from more than $12 llion in 1980 to almost $16 million in 1985, with ports of more than $13 million and $16 million, pectively. U.S. companies such as Everest and nnings should retain their 25 percent share of the port market. Therapeutic equipment is also im- rted from Germany, Japan, Denmark, Norway, the ited Kingdom, and Hong Kong.

Philips manufactures hydroelectric devices, and thermy units, including shortwave and microwave paratus. Enraf Nonius makes diathermy units, rasonic systems, low-frequency muscle stimulation vices, massage traction hydrotheraphy systems, and ercise equipment.

Sensory aids and adaptive systems.—Sales of nsory aids and adaptive systems are projected to ow from nearly $9 million in 1980 to more than $10 llion in 1985. Imports are forecast to account for proximately half of all sales, with purchases from S. companies reaching $400,000 by 1985.

Health Care Systems

Health care in the Netherlands is provided primarily the private sector, and financed by a variety of vernment and private health insurance plans. Under ese schemes, medical care is provided on a contract sis. Approximately 70 percent of the people insured covered by compulsory health care plans, and out 30 percent are covered by private and voluntary ans. Statutory insurance includes the Health Insur- ce Act and the Exceptional Medical Expenses Act. e latter covers the whole population and pays most the cost of preventive medicine and expensive ng-term institutional care.

In 1978, some 26 billion guilders, about $13 lion, was spent on health care, two-thirds of which s expended on hospitals. Of the total amount, 67 rcent came from compulsory insurance contribu- ns by employers, employees, and the self- ployed; 25 percent from private payments includ- g private health insurance contributions; and 8 rcent from government grants. By 1981, 29.6 llion guilders in health care was financed 71 percent om compulsory insurance contributions, 24 percent om private payments and insurance, but less than 5 rcent from government grants.

Annual expenditures for medical equipment, sup- ies, and furniture are expected to increase from $169 illion in 1980 to $202 million in 1985 (see table 5). eneral hospitals will continue to account for half of l expenditures, with university medical centers and obile and permanent health care/population screen- g centers together making up one-fourth of all penditures.

The Dutch Ministry of Welfare, Health and Cultural ffairs determines both the health services to which dividuals covered by one of the existing health surance schemes are entitled and the insurance premiums. In addition, the Ministry issues building permits for hospitals, monitors the quality of health care, and is responsible for enforcing all health care legislation.

The Health Insurance Fund Council controls the finances of the health insurance funds' compulsory contributions and approves agreements on fees and charges between health care professionals and the health insurance funds. It also acts as an advisor to the Ministry of Health on the health insurance plans. The Council consists of representatives of health care organizations, health insurance companies and funds, employer and employee organizations, and individuals appointed by the Ministry of Health.

Current health care policy in the Netherlands focuses on controlling the cost of health care, although the Government has also turned its attention to the problem of how health care costs are allocated. Until recently, the cost of health care was largely determined by the health insurance funds, but opinion has now turned in favor of greater government control of the nation's health care system. Between 1970 and 1980, the rate of economic growth decreased considerably, while medical costs continued to rise. This led the government to look for ways of exercising some control over costs without lowering standards.

The Health Services Act and the Health Care Charges Act, passed in 1982 and being gradually implemented, are designed to improve the planning and coordination of the nation's health care services. The aim of the first Act is the organization of health care facilities on a regional basis. Each province will have a full complement of health care services, overseen by regional authorities. The central Government will be responsible for determining the overall framework and for administering special facilities whose services extend beyond provincial boundaries.

Table 5. — Netherlands: Expenditures for medical equipment, supplies, and furniture by major users sectors, 1980 and projected 1985
(in millions of U.S. dollars)

	1980		1985	
	Equipment/ supplies	Furniture	Equipment/ supplies	Furniture
General hospitals	74	15	85	15
University medical centers	16	5	19	6
Specialized medical institutions, e.g., cancer centers	8	2	10	2
Military hospitals	6	1	7	1
Clinical laboratories	15	3	20	3
Mobile and permanent health care/population screening centers	15	3	22	4
Physicians (private practitioners)	5	1	7	1
Total	139	30	170	32

Source: Netherlands Ministry of Public Health and estimates from International Trade Administration, Office of Trade Information Services research study.

Table 6. — Netherlands: Hospitals, beds and occupancy rate 1975-81

	As of Dec. 31st			
		Beds		Bed occupancy
	Institutions	(1,000)	(per 1,000 inh.)	rate[1] (percent)
Hospitals				
1975	248	74.5	5.4	85.1
1979	233	73.7	5.3	83.8
1980	231	73.1	5.2	83.3
1981	231	72.7	5.1	82.4
Psychiatric hospitals				
1975	72	26.1	1.9	93.3
1979	74	24.8	1.8	92.5
1980	73	24.7	1.7	92.9
1981	78	25.0	1.7	93.3
Homes for mentally retarded				
1975	128	26.2	1.9	98.0
1979	142	28.7	2.0	97.8
1980	146	29.3	2.1	97.3
1981	146	29.5	2.1	97.6
Nursing homes				
1975	298	40.5	3.0	95.3
1979	310	45.6	3.2	96.5
1980	326	46.9	3.3	96.9
1981	327	47.4	3.3	97.3
Children's hospitals				
1975	27	1.6	0.1	
1979	20	1.2	0.1	
1980	19	1.0	0.1	
Institutions for physically handicapped				
1979	13	1.8	0.1	
1980	13	1.8	0.1	

[1] In-patient days during the year divided by the product of average number of beds and number of days in the same year.

Source: Statistical Yearbook of the Netherlands 1982, published by the Netherlands Central Bureau of Statistics, The Hague, 1983.

The second bill, the Health Care Charges Act, is designed in part to achieve an equitable system of health care charges. Before the Health Care Charges Act came into force, the rates that could be charged for treatment covered under the Health Insurance Act and the Exceptional Medical Expenses Act, were subject to approval by the Health Insurance Funds Council. The rates that could be charged for the privately insured, however, required the approval of the Minister for Economic Affairs. Hospital charges came under a different system and were fixed by a separate body, the Central Council on Hospital Charges, subject to approval by the Health Insurance Funds Council. Under this Act, one body, the Central Health Charges Board, is charged with controlling health care charges, and will be granted the authority to set charges itself, notably when an agreement between parties concerned cannot be reached. The existence of a single entity responsible for health care charges will also serve to bring into alignment the rates of compulsory and private insurance plans.

The 814 hospitals and medical inpatient institutions in the Netherlands comprise 327 nursing homes, 231 general and special hospitals, 146 institutions for the mentally ill and retarded, 78 psychiatric hospitals, and 32 other health care facilities (see table 6). More than 80 percent of Dutch hospitals are privately operated, and about 75 percent of hospital personnel are employed by private organizations.

The prevailing policy is to merge several small hospitals/institutions to create hospital units with more than 250 beds. Although this policy was prompted in part by the desire to make more efficient use of hospital labor, it was also the result of a decreasing percentage in the occupancy of beds. The government has proposed further closing down of under-utilized hospitals.

At present, there are approximately 28,000 medical practitioners in the Netherlands, or one practitioner for 511 inhabitants. Internal medicine, neuro/psychopathology, and general surgery attract the largest number of specialists (see table 7).

Most of the publicly funded medical research is carried out by the university hospitals and the Central Netherlands Organization for Research and Applied

Table 7. — Netherlands: Number of physicians by area of specialization 1978-82

	1978	1979	1982
Allergies	11	12	13
Anesthetics	497	536	68
Cardiology	250	269	343
Cardiopulmonary surgery	21	25	4
Dermatology	267	277	309
General surgery	703	737	843
Internal medicine	1,158	1,212	1,387
Ears, nose, and throat	359	368	393
Pediatrics	560	590	670
Medical microbiology	115	122	143
Pathology	186	201	228
Clinical chemistry	11	11	12
Lung and tuberculosis	300	313	334
Gastroenterology	24	27	32
Mouth and jaw, surgery	5	5	—
Neurology	47	48	58
Ophthalmology	373	387	430
Orthopedics	198	206	263
Plastic surgery	54	59	78
Radiology	366	360	339
Radiodiagnostics	113	141	265
Radiotherapy	40	45	66
Rehabilitation	143	145	184
Rheumatology	62	67	87
Urology	142	154	184
Gynecology and obstetrics	488	515	598
Neuro and psychopathology	933	927	900
Neurology	141	167	258
Psychiatry	302	361	593
Total specialists	7,869	8,287	9,731
General practitioners	5,188	5,339	5,492
Public health physicians	1,186	1,208	1,459
Other physicians	9,526	10,044	11,354
Total physicians	23,769	24,878	28,036

Source: Statistical Yearbook of the Netherlands 1982 and ITA Market researc study.

cience (TNO). Of the $462 million spent on medical research in 1979, about $280 million went to the niversity and teaching hospitals, $45 million to the NO, and $130 million to regional health laboratories nd public health institutes. The National Hospital nstitute (National Ziekenhuisinstituut—NZI), carries ut applied research on behalf of Dutch hospitals and ealth care services.

Marketing Practices

Agents and distributors are used extensively in the Netherlands, although the level of involvement epends on the sophistication of the product, with a maller role when the product in question is a elatively expensive, technologically advanced ystem.

Local physicians, surgeons, and technical staff trongly influence the selection of medical equipment, which they expect to be marketed in terms of its echnical attributes. The main factors governing a urchasing decision are: confirmation of the product's uality and reliability from other end users; ease of peration and maintenance; availability of technician nd operator training; good aftersales service, preferbly provided under contract; and price.

Manufacturers should be prepared to demonstrate heir products in a working environment or similar etting, and arrange for the input of prospective end sers when developing equipment applications. In ddition, suppliers should also be able to tailor their quipment to interface with existing systems in a ospital or clinic. The manufacturer's representatives must meet personally with prospective users and hould also be active at the hospital administrative evel, as hospital directors are encouraged by the Dutch Government to buy domestically-made products.

With the increasing sophistication of medical equipment, the need to train agents has grown. Overseas suppliers should provide sufficient training and support to their agents to allow them to compete with the agents of manufacturers from nearby European countries.

Agents prefer to work with c.i.f. prices for imported equipment, rather than ex plant prices. Price markups vary considerably, and suppliers should thus ensure that they negotiate delivered prices with their agents to allow for landing costs, duties, and, where appropriate, aftersales service.

A central government agency, the Rijkskoopbureau, is responsible for purchasing equipment for the 8 university hospitals and most of the 50 special hospitals. Although the agency, which selects suppliers and establishes prices, has been advised to buy Dutch-made equipment, a supplier, when warranted, can work with the agency to develop specifications fitting the firm's product.

Table 8. — Netherlands: Percent customs duties on health and medical equipment from non-EEC countries

CCCN classification		Percent
300400	Bandages	10.6
300510	Sterilized catgut	11.4
300520	Other sterilized sewing thread for surgical use	11.4
300525	Reagents for blood testing	11.4
300530	X-ray fluids and reagents for diagnostic purposes	11.4
300540	Dental cements and fillings	11.4
841751	Sterilizers with electrical heaters	8.1
841754	Sterilizers for medical-surgical use	6.7
9001	Contact lenses and spectacle lenses	13.2
9003	Spectacle frames	7.2
901701	Electrocardiographs	7.7
901705	Other electrodiagnostic equipment	7.7
901713	Ultraviolet or UV/IR apparatus combined	7.7
901716	Diathermy apparatus or ultrasonics	7.7
901717	Other diathermy apparatus	7.7
901721	Other electromedical apparatus	7.7
901739	Nonelectric dental instruments	7.7
901740	Instruments and apparatus for anesthetics	7.7
901750	Diagnostic (other than electrodiagnostic)	7.7
901770	Syringes	7.7
901790	Other medical, surgical, and veterinary equipment	7.7
901811	Electrical vibromassage equipment	6.3
90819	Mechanical, physical, and massage equipment	6.3
901830	Apparatus for oxygen, ozone, or aerosol treatment and resuscitation	6.3
901850	Other breathing apparatus of all kinds	6.3
901925	Bone and joint prosthesis	9.5
901931	Hearing aids	4.9
901935	Parts thereof	4.9
901951	Heart Stimulators	7.7
901991	Other orthopedic appliances	8.6
901995	Splints	8.6
902011	Medical X-ray equipment	6.3
902051	Radioactive apparatus for medical use	6.3
902071	X-ray tubes	6.3
902075	X-ray tubes and diffusing screens	6.3
902099	Other parts and accessories for X-ray and nuclear apparatus	6.3
940290	Operation tables and furniture	6.7

Source: International Trade Administration, Office of Trade Information Services research study.

Trade Regulations

All medical equipment, including that produced domestically, is subject to an 18-percent value added tax. Medical equipment is imported from EEC countries duty free; the customs duties applied to medical equipment imported from non-EEC countries are shown in table 7.

Technical Requirements

The Netherlands enforces EEC directives for electrical equipment, including medical equipment. The "low-voltage directive" applies to most equipment with a voltage rating between 50V and 1,000V AC and between 75V and 1,500V DC. Single-phase electrical equipment operates on 220V, 50 Hz, and three-phase equipment operates on 380V, 50 Hz. U.S.

Most Salable Products

Cardiology equipment
- Telemetry systems for transmitting electrocardiograms (and the associated central monitoring stations)
- Echocardiographs
- Software systems for patient recordkeeping
- Intracardiac catheters

General hospital equipment
- Central station patient monitoring equipment (and software)
- Bedside patient monitoring systems

Operating room equipment
- Ophthalmic products
- Laser-based surgical instruments

Miscellaneous equipment
- X-ray systems for population screening
- Mammographic and other screening systems
- Computer-based multiphase screening centers

Clinical laboratory equipment
- Blood/gas analyzers
- Automated cell counters
- Automated sample analyzers
- Nuclear magnetic resonance analytic equipment

Disposables
- Nonwoven products
- Prepared trays

Orthotics and prosthetics
- Intracardiac pacemakers

Physical and occupational therapy equipment
- Hydrotherapy and ultrasonic therapy units
- Diathermy units

Sensory aids
- Communication aids for the partially sighted
- Training aids

Food and Drug Administration Bureau of Medical Devices standards are widely accepted in the Netherlands. However, beginning January 1, 1984, under the "Decree for Marketing of Sterilized Medical Devices," all such devices will have to be registered with the National Institute of Public Health. Information concerning the sterility of the device and its packaging will have to be provided (e.g. intended use, method of sterilization, composition and parameters). Registration forms may be obtained from:

Office of Registration of Medical Devices
National Institute of Public Health
P.O. Box 1
3720 BA Bilthoven
Netherlands.

Dutch hospitals comply with several national rules and regulations on ionizing radiation and the safety of medical equipment. The Dutch Government is an active participant in the International Electrotechnical Commission, which has approved the first international agreement on the manufacture, installation, and application of electrical equipment used in medical practice. In addition, the Dutch Normalization Institute issues regulations on hospitals, and the Hospital Council of the College for Hospital Supplies sets standards for operating rooms and the quality control of medical equipment.

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-2988

The Survey summarizes a 159-page research report prepared by Sira Institute of Chislehurst, Kent, England, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Medical Equipment—Netherlands," ITA 82-08-509.

Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in Netherlands and trade statistics compiled by the Department of Commerce's Bureau of the Census.

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Netherlands

CMS/SGR/421/83, July 1983

CMS

Country Market Survey

Sporting Goods and Recreational Equipment

Netherlands

DEPOSITORY
AUG 5 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
nternational Trade Administration

With ample free time on their hands and supported by the prosperity of the welfare state, the Dutch offer a ready market for sporting goods and recreational equipment. Per capita income in 1982 averaged $10,314 and per capita disposable income averaged $5,644. Sales have continued to grow through 1982 despite the recession. More people are engaging in sports, and participants tend to come from the richer social classes who are less affected by the economic climate.

Table 1.—The Netherlands: Sales of sporting goods and recreational equipment, 1981-82 and forecast 1984 and 1987

(in thousands of U.S. dollars)

	1981	Estimated 1982	Forecast 1984	Forecast 1987
Equipment for racket sports				
Retail sales	10,920	15,025	16,527	19,006
Wholesaler and direct sales to institutions	5,880	5,290	8,900	10,234
Total	16,800	20,315	25,427	29,240
Fishing equipment				
Retail sales	22,750	29,890	32,879	37,810
Wholesaler and direct sales to institutions	3,250	4,270	4,697	5,402
Total	26,000	34,160	37,576	43,212
Skiing equipment				
Retail sales	16,000	22,100	24,314	27,960
Wholesaler and direct sales to institutions	4,000	5,520	6,078	6,990
Total	20,000	27,620	30,392	34,950
Skates and roller skates (including parts)				
Retail sales	5,600	7,738	NA	NA
Wholesaler and direct sales to institutions	2,400	3,317	NA	NA
Total	8,000	11,055	—	—
Bicycles				
Retail sales	236,600	278,592	270,854	282,462
Wholesaler and direct sales to institutions	101,400	119,396	116,080	121,055
Total	338,000	397,988	386,934	403,517

Source: Central Bureau of Statistics, importer/distributor estimates, and International Trade Administration, Office of Trade Information Services market research report (see Additional Information box).

Several segments of the Dutch market offer particularly promising new sales opportunities for U.S. manufacturers: racket sports, fishing, and skiing equipment, and skates and bicycles. The market for these five product categories exceeded $491 million[1] in 1982 and is expected to approach $520 million in 1987 (see table 1). Retail outlets account for more than 90 percent of sales. Local manufacture of these items is limited, and imports totaled $84.6 million in 1982 (see table 2). Shipments from the United States amounted to almost $1.5 million in 1982 and are projected to approach $2 million in 1987.

The Dutch show very little interest in golf, archery, baseball, and softball. Gymnastics are on the decline, and local producers and European Economic Community (EEC) manufacturers are well established. The Dutch version of billiards and pool is played on a table without pockets, an item not commonly played in the United States. U.S. manufacturers of motor homes and/or travel trailers have difficulty competing in the face of 48-percent import duties coupled with transportation and insurance costs. However, American producers of marine engines are already well represented in the Netherlands.

Product Market Profiles

Racket sports equipment.—Sales of equipment for racket sports are projected to rise from $20.3 million in 1982 to almost $30 million in 1987. No local companies manufacture tennis, badminton, or squash rackets; tennis or squash balls; shuttlecocks; or racket covers. An announcement was made in October 1982 that Prince Manufacturing Inc. (New Jersey) planned to establish a base in southern Holland.

U.S. manufacturers were able to double the value of their exports between 1980-82, largely in a period when an unfavorable exchange rate existed.

The U.S. market share of badminton and squash racket sales was negligible during 1981-82 due to the exchange rate (which almost doubled prices) and the lack of visibility of U.S. players or products in international competition. However, sales of American products are expected to rise substantially, based on a greater marketing effort by U.S. manufacturers, a continuing increased interest in racket sports, and a more favorable exchange rate. There is a grow-

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1=DFL2.01 (1979), DFL1.99 (1980), DFL2.50 (1981), and DFL1.99 (1982 and subsequent years). Values for years through 1982 are given in current dollars; values for 1984 and subsequent years are given in 1982 constant dollars.

Table 2.—The Netherlands: Imports of sporting goods and recreational equipment by country of origin, 1980-82 and forecast 1984 and 1987

(in thousands of U.S. dollars)

				Forecast	
	1980	1981	1982	1984	1987
Racket sports					
Tennis rackets					
United States	552	919	1,332	1,509	1,776
Taiwan	1,707	1,459	2,270		
United Kingdom	1,241	1,172	1,483		
Belgium	1,117	922	1,159		
All others	1,575	1,207	1,516		
Total	6,192	5,679	7,760		
Badminton and other rackets					
United States	36	—	—	60	180
Taiwan	1,031	720	904		
United Kingdom	355	323	486		
Japan	293	343	430		
All others	458	195	245		
Total	2,173	1,581	2,065		
Fishing equipment					
Fish hooks					
United States	—	—	—	—	—
Norway	185	167	262		
France	43	48	60		
United Kingdom	27	—	—		
All others	32	29	70		
Total	287	244	392		
Fishing reels					
United States	—	25	31	60	191
Japan	857	617	775		
France	301	245	307		
South Korea	216	230	304		
All others	418	280	372		
Total	1,792	1,397	1,789		
Other fishing equipment					
United States	143	160	201	402	804
South Korea	2,192	1,385	1,759		
Japan	1,607	1,099	1,453		
France, Germany	990	499	733		
All others	2,131	1,789	2,389		
Total	7,063	4,932	6,535		
Skiing equipment					
Skis					
United States	491	222	278	1,112	2,780
Austria	2,414	2,433	3,380		
Germany	666	382	854		
Finland, France	157	362	548		
All others	672	396	585		
Total	4,400	3,795	5,645		
Ski bindings					
United States	—	—	—	35	106
Austria	1,120	754	977		

Table 2.—The Netherlands: Imports of sporting goods and recreational equipment by country of origin, 1980-82 and forecast 1984 and 1987—Continued

(in thousands of U.S. dollars)

France	643	678	887		
Germany	275	200	266		
All others	170	129	174		
Total	2,208	1,761	2,304		
Ski poles, parts and accessories for skis and poles					
United States	33	—	—	33	66
Germany	216	213	267	—	—
Italy	177	127	180		
France	188	35	58		
All others	99	181	159		
Total	713	493	664		
Ski boots with leather uppers					
United States	42	—	—	—	—
Italy	408	—	—		
Germany	53	24	26		
Austria	34				
All others	36	9	10		
Total	573	33	36		
Ski boots with plastic uppers					
United States	NA	47	61	130	697
Italy	NA	1,148	1,467		
Austria	NA	1,043	1,362		
Germany	NA	329	413		
All others	NA	446	681		
Total	—	3,013	3,984		
Ice skates					
United States	145	—	—	208	520
Romania	2,696	900	1,117		
Taiwan	1,905	863	1,094		
Japan	1,261	464	660		
All others	5,203	1,610	2,133		
Total	11,210	3,837	5,004		
Roller skates					
United States	41	—	—	39	79
Taiwan	5,444	1,295	1,589		
Germany	805	969	1,200		
United Kingdom	490	317	374		
All others	251	20	32		
Total	7,031	2,601	3,195		
Bicycles					
United States	169	65	82	565	2,206
France	16,961	13,729	17,247		
Germany	18,062	10,254	12,882		
Taiwan	3,779	4,194	5,268		
All others	10,695	7,834	9,841		
Total	49,666	36,076	45,320		

Source: Central Bureau of Statistics, Importer/Wholesaler estimates.

ing preference for quality equipment; even beginners are increasingly likely to purchase top-line products, favoring U.S. makers. The Wilson Sporting Goods Company and Prince Manufacturing Inc. (United States) have had notable success in the Dutch market.

Third-country suppliers of racket sports equipment originate primarily from the United Kingdom, Belgium (both having duty-free access), and Taiwan. U.K. suppliers include Slazenger, Dunlop, Grays, Benson, Kenway, and Carlton. The major Belgian supplier is Donnay, claiming to be the world's largest manufacturer. Taiwanese firms sell through a large importer/distributor, Rucanor B.V. and dominate the inexpensive end of the market. The Japanese firm Yonex is maintaining high visibility and building a good reputation for high quality by having their equipment used by top players. Importers and retailers believe that the racket sports market is somewhat "fashion conscious," receptive to innovation and always aware of the "in" line at the moment.

Fishing equipment.—Fishing is a very popular recreational and sporting pursuit in the Netherlands. Sales of fishing equipment reached $34 million in 1982 and are forecast to rise to more than $43 million in 1987. No firms manufacture sport fishing equipment locally. Imports from the United States are still small—$232,000 in 1982. Most U.S. products are expensive, due partly to the present high exchange rate, but the quality is rated good. U.S. suppliers include Fenwick (fishing rods), Scientific Anglers (fly fishing rods and lines), and Shakespeare (all kinds of fishing equipment). Shakespeare has a subsidiary in the Netherlands, Kenzo B.V.

Japanese manufacturers are the most important suppliers of fishing equipment accounting for about 43 percent of the market for fishing reels and 22 percent of other fishing equipment. Major suppliers are Shimano Fishing Tackle Co. Ltd., Olympic Fishing Tackle Co. Ltd., Daiwa Seiko, and Shakespeare Ltd., a subsidiary of the U.S. firm, Shakespeare. South Korea follows with shipments from Hai Dong International and Oriental Industry Co. France is the major EEC supplier, and the following companies import duty-free: ETS, Mepps, Nice, Bouillard Freres S.A., Saint Germain Du Plain, Fouineteau S.A., Gray, Le Liege Halieutique, Lavardoc, Ragot S.A., Loudeac, Saint-Freres Filets, Etaples, Deboissey S.A., and Montigny Les Corneilles.

Skiing equipment.—The number of skiers is growing every year, and sales of skiing equipment have kept pace, rising from $20 million in 1981 to $27.6 million in 1982. Sales are expected to approach $35 million in 1987. The Netherlands has good transportation and communication connections with countries that offer excellent skiing facilities.

All skiing equipment is imported. Wholesalers and retailers have commented on their satisfaction with U.S. products while lamenting the high exchange rate which caused sales of U.S.-made goods to decline to $222,000 in 1981. Projections for sales approaching $3 million in 1987 are based on a more favorable rate and a stronger U.S. marketing presence. AMF Inc. (Head Skis, Tyrolia bindings) ships from its manufacturing facilities in Austria, and K-2 Corporation has established representation in the Netherlands.

Companies in Austria and West Germany account for the lion's share of the market, both having duty-free access. Austrian suppliers include Atomic, Blizzard, Dynamic, Fisher, Kastle, Kniessel, and Dynafit. West Germany is represented by Sohler, Volkl, Marker, Geze, and Klemm. A Finnish manufacturer of cross-country equipment has a regional distributor, Karhu-Titan Netherland B.V. Marketing techniques and practices are closely guarded secrets. However, it is easy to notice that major suppliers spend considerable advertising funds to increase their products' awareness.

Ice skates and roller skates.—Just about anyone who can walk also ice skate or roller skate, and the advent of polyurethane wheels has brought a new dimension to this recreation, particularly in the larger cities. Skates sales rose from $8 million in 1981 to $11 million in 1982. Four domestic firms manufacture ice skates. The most significant producer, Schaatsenfabriek Viking B.V. with annual output of about 60,000 pairs of speed skates, holds 90 percent of the market. The other three firms produce ice skates only as a sideline, and their combined production is a few thousand pairs. Good market potential exists for ice hockey skates. Speed skates with lighter weight materials and newer steel alloy blades and speed skates with adjustable blades are expected to be strong sellers in about 2 years.

Sales of U.S.-made ice skates have dropped, but are forecast to reach $520,000 by 1987 as a result of greater marketing efforts, competitive pricing, and a more favorable exchange rate.

The major third-country sources of ice skates are Taiwan, Romania, and Czechoslovakia. Almost without exception the skates are of the ice hockey type, low in price and of poor to moderate quality. Beginners and parents buying for their children are the major customers. Suppliers are Avento (Taiwan), Kovopol (Czechoslovakia), Tornado (Romania), Roces (Italy), Bauer (Canada), Micron (Canada), and Ballangrud (Norway). Canadian manufacturers produce a high quality hockey skate, and Ballangrud was recently taken over by a Canadian company producing good quality speed skates.

Roller skates are made by two Dutch firms, Mezo B.V. and Brabantia Valkenswaard B.V. Both produce the "toy-type" roller skate that straps on, with metal, plastic, or rubber wheels. Specialty retail shops are well stocked with American-made roller skates, and the trade estimates that virtually all the quality equipment comes from such U.S. firms as Skate-Lite, Sportpax, Acs-Skatemate, Lazer, Independent, Sure-Grip, Kryptonics, Sims, Powell, Gyro, Skate-on Haight, and RC Sports. Kingdom Enterprise Co. Ltd. of Taipei, Taiwan is the major third-country supplier of roller skates, but the quality is poor and recycled metals are often used. Wheels are made of vinyl instead of the more durable polyurethane.

Bicycles.—Motocross (BMX) racing is the latest craze in the Netherlands, and new racing courses cannot be constructed fast enough to keep up with the growing number of participants. Sales of all kinds of bicycles are forecast to advance from $398 million in 1982 to almost $404 million in 1987.

Ten Dutch manufacturers have captured 67 percent of the market. About 20 percent of their output uses imported frames, about one-third using high-quality frames from the United Kingdom and Japan, and the rest using lesser quality ones from Taiwan and India. Batavus Intercycle B.V. produces about 370,000 units annually; 30 percent is exported. Unikap N.V. produces about 270,000 bicycles, and Gazelle Rijwielfabriek B.V., 340,000. TI-Raleigh Nederland B.V. assembles some 70,000 bicycles yearly from parts produced in the United Kingdom. Batavus Intercycle responded quickly to the Motocross (BMX) bicycle interest. It is unlikely that their present small production is very profitable, but their sponsorship of BMX racing is seen as an investment on the part of the firm. One local firm, Unikap, N.V. is experiencing severe financial problems and its future is doubtful.

U.S. bicycles sold in the Netherlands are, almost without exception, geared to BMX racing. Although local producers are responding to this new segment of the market, interest in the U.S. products remains high since all champion riders prefer the American product. Only the 17-percent duty coupled with the unfavorable exchange rate has hindered greater sales. Projections are predicated on a more favorable exchange rate along with the rising demand. U.S. firms with notable success in this segment include BMX Products Inc., Huffy Corporation, and Schwinn Bicycle Company. Demand for other U.S.-made bicycles such as a standard, touring, or racing appears to be nil.

Sales of inexpensive bicycles from Taiwan and Korea are on the decline as well as sales of top quality racing units. Demand is increasing for good quality standard, touring, and semi-sports bikes. The ranking third-country suppliers of good quality standard, touring, semi-sports, and BMX bicycles are Peugeot and Motobecane (France) and the Japanese firms Shimano, Koga, Miyata, and Bridgestone Cycle Company. Taiwanese suppliers active in the market include Long Rex Industrial, San Yakos Enterprise, Trimax Industrial, and U-Stone Enterprises. The German companies Kalkhof GMBH and Enik GMBH sell bicycles assembled with frames made in the Far East.

Profile of Sports and Recreational Activities

A recent survey by the Dutch Ministry of Culture, Recreation and Social Welfare concluded that 62 percent of the population (see tables 3-5) participated regularly in sports and that, on average, they spent a full 11 hours a week on these activities. Membership of the Dutch Sports Federation soared from 1.8 million in 1966 to 4.5 million in 1982.

Government at both the local and national level has been instrumental in this development, primarily by providing the facilities needed to accommodate the increased interest in sports and recreation (see table 6). However, the rate of spending on sports and recreation infrastructure during the 1970's will not be maintained in the 1980's. The ministry has, on average, made greater cuts on sports spending than on other parts of its budget. Over 30 percent less money will be spent on the building of new facilities; cuts have also been made in the educational programs for coaching and instruction. One bright spot is that more will be spent in an effort to stimulate a larger share of the population to participate in sports or recreation. This is, in part, due to the results of a recent survey that showed that 45 percent of the 4 million people who do not participate in any sport would like to do so. A greater effort will therefore be made to inform and encourage those whose participation in sports is low, that is, the poorer social classes, women, those over 60 years, large families—four or more children, and those working in the agricultural sector.

Table 3.—The Netherlands: Population of major cities as of January 1982

City	Population
Rotterdam	1,025,580
Amsterdam	945,062
The Hague	677,962
Utrecht	494,898
Eindhoven	373,233
Arnhem	290,506
Heerlen/Kerkrade	264,107
Enschede/Hengelo	247,266
Nijmegen	227,840
Haarlem	221,551

Source: Central Bureau of Statistics.

Table 4.—The Netherlands: Population, population growth rate

	Total population January 1 (in millions)	Population average annual growth rate - %
1970	13.0	
1971	13.1	1.14
1972	13.3	.89
1973	13.4	.77
1974	13.5	.80
1975	13.6	.99
1976	13.7	.59
1977	13.8	.60
1978	13.9	.63
1979	14.0	.75
1980	14.1	.83
1981	14.2	.54
1982	14.3	

Source: Central Bureau of Statistics.

Table 6.—The Netherlands: Index of number of playing fields, courts, etc. of competion standard (1970 = 100), 1975, 1980, and 1982

	1975	1980	Absolute No. 1980	1982
Soccer	123	143	7,430	7,600
Field hockey	126	157	992	1,052
Korfbal	116	136	900	952
Handball	176	250	921	990
Tennis	148	236	6,781	7,332
Baseball	211	273	169	175

Source: Central Bureau of Statistics.

The character of sports activity in the Netherlands is markedly different from that in the United States. The Dutch educational system puts little emphasis on physical education. Educational institutions (including the universities) have little or no organized sports programs and few if any facilities for sports. Intercollegiate, intramural, or interschool competition does not exist.

Responsibility for the organization of sports competition, coaching, and acquisition of facilities and equipment rests mainly with the 25,000 sports clubs throughout the Netherlands (see table 7). Local and national Government is often a source of subsidies—usually by provid-

Table 5.—The Netherlands: Population by age category

	Total population (in millions)	0-19	6-15	20-59	60-64	65+
				Percent		
1970	13.0	35.9	18.0	49.6	4.4	10.1
1975	13.6	34.2	17.8	50.7	4.4	10.7
1979	14.0	32.0	17.2	52.5	4.2	11.3
1980	14.1	31.5	16.8	53.0	4.1	11.5
		Anticipated growth: maximum				
1990	14.6	27.2	12.5	56.0	4.5	12.3
2000	15.2	26.9	14.0	55.7	4.6	12.8
		Anticipated growth: minimum				
1990	14.2	24.8	11.6	57.9	4.6	12.7
2000	14.3	22.6	11.6	59.0	4.9	13.7

Source: Central Bureau of Statistics.

ing facilities and the required maintenance. Space is then leased to the clubs by the Government. Every town or neighborhood has a variety of clubs devoted to a particular sport. For certain very popular sports such as soccer, an interested, potential participant may choose among 5, 10, or more clubs. Less popular sports such as cricket or archery may not be represented in some areas. The sports clubs play a significant social function. Many have their own clubhouse with bar facilities and organized outings, dinners, and parties for their members. Older members who no longer wish to play competitively often stay on and help in a coaching or organizational capacity.

Racket sports.—The interest in racket sports—especially tennis—has grown enormously in the past few years. The membership of the Royal Dutch Lawn Tennis Association increased its membership by an average of 20 percent annually during the years 1974-80. The rate of growth after 1980 continued at a lower level, about 10 percent per annum. As of January 1981, the association counted 513,000 members, making it the second largest sports association in the Netherlands (after 'king' soccer with over 1 million members). The Association estimated the number of tennis players outside of the Association at 200,000, a total of over 700,000 tennis players—about 5 percent of the population. The country has over 7,300 tennis courts, but the Lawn Tennis Association estimates that at least another 1,300 courts are needed just for its members. Most local governments are making a serious attempt to meet the increased demand for more tennis courts. For instance, the city of Rotterdam is considering a proposal to build an additional 100 outdoor and 15 indoor courts by 1985, thereby increasing its number of courts by over 50 percent.

Badminton has also enjoyed considerable growth in the last few years. Membership in the Dutch Badminton Association totaled 50,000 persons playing in 546 clubs in 1977 . By 1982, the figures had reached 80,000 members playing in 610 clubs in 1982.

The recently introduced sport of squash has a small but steadily growing membership. The Dutch Squash Rackets Association presently numbers 13,000 members playing in 76 clubs. The association estimates the total number of squash players at 30,000. The country's 120 squash centers have some 400 squash courts. The Dutch prefer to play softball—courts are smaller and differently lined than in the hardball game more popular in the United States.

Table 7.—The Netherlands: Registered participants in some organized sports, 1975, 1980, and 1982

	1975	1980	1982
Soccer	900,000	1,051,500	1,080,000
Gymnastics	365,291	470,608	450,000
Tennis	173,300	468,000	513,000
Volleyball	67,000	154,500	170,000
Field hockey	66,900	101,580	125,000
Handball	72,300	100,500	115,000
Squash	2,500	NA	13,000
Badminton	48,000	70,000	80,000
Korfbal	74,000	105,400	122,000
Ice skating	130,000	139,000	130,000
Swimming	171,000	169,200	168,000
Skating	35,000	72,000	90,000
Roller skating	800	2,000	2,500
Total (All sports)	3,013,500	4,235,600	4,500,000

[1] Korfbal is a variation on the theme of basketball and said to be the only competetive sport allowing men and women to play together on fully competetive basis on the same team.

Note: No estimate of number of persons having a membership in more than one sports club.

Source: Nederlands Sport Federtie.

Fishing.—The Netherlands' many canals and waterways, and its proximity to the sea, have made sportfishing a well-established and popular recreational pasttime. All sport fishermen 15 years and older need a license for fishing in inland waters. No license is required for coastal or deepsea fishing. In 1981 more than 1 million licenses were issued. Considering those under 15 who require no license, the significant number of persons fishing without licenses, and the coastal and deepsea fishermen, about 1.5 million persons are sport fishermen. One is never far from a fishing hole in the Netherlands. Even those living in the heart of cities like Amsterdam, Utrech, or the Hague are able to fish in the canals, often literally outside the door. Fishermen can frequently be seen throwing their lines over a bridge or sitting in a chair alongside a canal with the daily traffic flying behind them. The serious sport fisherman still prefers the early morning or evening, and cycles or drives to the country waterways, canals, and lakes. Fishermen line the beaches by the coastal towns late at night and fish for flatfish and sea eels. Salt water sport fishing in the Netherlands is becoming more popular.

About 500,000 people do some salt water fishing every year (mostly coastal fishing), and deep sea fishing seems to be attracting more enthusiasts. However, the unreliable weather on the North Sea and the short summer season make it a viable commercial venture for only a few charter boats.

The Dutch Federation of Sport Fishermen has a membership of 500,000 in 900 sport fishing clubs. Two-thirds of the approximately 1 million acres of quality fishing (fresh) water in the Netherlands are stocked and controlled by the Federation, which lease the fishing rights from the Government. Only members of the associated clubs are allowed to fish in these waters.

Skiing.—The Netherlands has neither the climate nor the topography for skiing, and no ski resorts. This has not prevented the sport from achieving considerable popularity. The outstanding ski resorts of Switzerland and Austria are only an 8- to 10-hour drive, and more than 500,000 Netherlanders took their winter vacations in these countries in 1979-80, twice as many as in 1974-75. Estimates for the winter of 1981-82 indicate that over 600,000 of the Dutch headed for the Austrian and Swiss winter vacation resorts. Although the present economic recession will substantially burden this activity, the good value offered by many resorts (especially in Austria) is expected to ensure that demand remains constant.

The Dutch Skiing Association counted 82,000 members in March of 1982. The Association estimated in October 1982 that it had gained at least another 8,000 members and expected to reach just short of 100,000 members by the end of the 1982-83 season. The total number of active skiers is estimated at 500,000 (including both cross-country and downhill skiers).

Ice skates and roller skates.1—The same canals, lakes, and waterways that are so conducive to the popularity of watersports are also instrumental in the keen interest in ice skating. The availability of natural ice is the determining factor for the recreational skater. As many as 1.5 million people skate on the frozen canals and waterways in the mid-winter months, and school children are given days off when ice conditions are suitable for skating. The Dutch winters are rarely cold enough to allow good skating conditions for more than 3-4 weeks a year.

The Royal Dutch Skating Association has 130,000 members, the avid skaters who make regular use of the limited artificial ice facilities. The majority of these are speed skaters with very little interest shown in figure skating. Ice hockey has about 8,000 enthusiasts playing in 18 clubs throughout the country. Professional activity in ice hockey is limited to six clubs. These clubs stock their top teams with Canadian or U.S. hockey players with Dutch parentage (these are eligible for Dutch citizenship as each team is limited to only two foreign players). The players stay for a couple of years and move on to more lucrative contracts in Switzerland or some other European countries before going back to North America.

The Dutch Roller Skating Association has about 2,500 members in 25 clubs, at least 40,000 people skate regularly outdoors during the summer months. The only permanent indoor roller skating facility in the Netherlands is located in Scheveningen. The advent of the polyurethane wheel has brought adults into a recreation formerly reserved for children. The sport has gained significant popularity in the larger cities, especially in the Hague. Roller hockey clubs have also recently been established. Currently, the 10 clubs have about 250 members.

Bicycles.—The predominantly flat countryside and the many bicycle paths make the bicycle most attractive as a mode of transportation in the Netherlands. The country's 14 million-people own more than 10 million bicycles, with over half of them used daily (see tables 8-10).

Cycling is primarily a method of transportation. The market for the super lightweight, custom-made racing cycles is limited to about 270,000 enthusiasts. Over the past few years, an increasing number of persons are buying second bicycles. Along with the solid, heavy, single-speed bicycle used for everyday transportation, a second bicycle (possibly a semi-racing or sports type bicycle with 3, 5, or 10 gears) is being pur-

Table 8.—The Netherlands: Bicycle ownership and use

	Percentage of Population
Own a bicycle	78
Does not own a bicycle	22
Uses a bicycle periodically	81
Never uses a bicycle	19
Frequency of use:	
Almost daily	52
At least once a week	32
Once every two weeks	16

Source: Institute of Applied Sociology—Report: Use of bicycle in The Netherlands, 1978.

Table 9.—The Netherlands: Use of bicycles

	Number of Bicycles	Kilometers (X 1000)
Transport to and from work	1,000,000	4,100,000
Transport to and from school	1,000,000	2,200,000
Cycle clubs, etc.	30,000	33,000
Rented bicycles other use (recreational, shopping, etc.)	7,825,000	2,347,500

Source: RAI: Bicycle statistics, 1980.

Table 10.—The Netherlands: Comparison of bicycle usage vs other transportation modes for recreational day trips

(in percent)

Mode of transportation	Within city or town	0-10 KM.	Outside town 10-200 KM.	Foreign Countries
Bicycle	31	22	7	4
Moped	4	6	3	—
Bus, streetcar	5	6	7	4
Car, motorcycle	26	61	79	85
On foot	33	3	—	—

Source: Central Bureau of Statistics; RAI: Bicycles in Statistics, 1980.

chased for recreational cycling and fitness.

The advent of BMX has been enthusiastically received by Dutch juveniles. About 70 race tracks have been constructed throughout the country with about the same number of BMX cycle clubs. An estimated 3,000 were qualified for competition as of November 1982, and racing events are held throughout the year. Competition cycles have to meet safety standards set by the Royal Dutch Cycling Association. The races attract both boys and girls and has received considerable publicity via local television.

Marketing Practices

Importers/agents sell sporting goods and recreational equipment to wholesalers, who in turn supply the retail trade. Importer/agents also act as distributors, supplying the retail trade directly (including cooperative members), and selling directly to institutional customers (mostly sports clubs). Mail order houses, department stores, discount houses, and wholesale cash-and-carrys place orders directly with the manufacturers in the country of origin. Local manufacturers book orders from the retail trade through their own salesmen.

Terms vary according to the country of origin, supplier/customer relationship, and size of order. Most imports are shipped sight draft with documents through a bank. Shipments from communist countries and Asia require an irrevocable letter of credit. Local manufacturers will grant up to 30-days credit for most of their customers.

Usually the importer/distributor applies a 30-40 percent markup on c.i.f. value plus import duty and port charges. The retail markup lies between 60 and 80 percent depending on the product. This markup includes the 18-percent value added tax applied to all manufactured products in the Netherlands. Purchase discounts and sales commissions are a guarded secret.

Trade Regulations

Products from the United States are subject to an import duty which is calculated as a percentage of c.i.f. value (see table 11). No imports duties are applied to products from the other EEC countries: Ireland, Denmark, Germany, Belgium, Luxembourg, Italy, France, United Kingdom, and Greece. Products from all sources are subject to a value 18 percent added tax which is based on landed cost, including import duty.

There are no non-tariff barriers for the products surveyed.

Table 11.—The Netherlands: Import duties on selected sporting goods

	Import duty percent of c.i.f. value	Value added tax percent of landed cost
Tennis rackets	11.2	18
Badminton and other rackets	8.2	18
Tennis balls, other balls	8.2	18
Racket covers	8.2	18
Skis, poles, bindings	8.2	18
Ski boots, leather uppers	8.0	18
Ski boots, plastic uppers	20.0	18
Fishing tackle and equipment	10.1	18
Fishhooks, unmounted	4.6	18
Ice skates	8.2	18
Roller skates	8.2	18
Bicycles, assembled	17.0	18
Bicycle parts	8.0	18
except seats and spokes	8.2	18

Source: The Netherlands Register of Import Duties (1982).

Additional Information

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The Survey summarizes an 82-page research report prepared by the U.S. Foreign Commercial Service, American Consulate, Amsterdam, and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report provides more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from the International Market Research Services at the above address.

When placing an order for this research, please request "The Market for Sporting Goods and Recreational Equipment—The Netherlands," IMR/SGR/421/82, December 1982.

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Country Market Survey

Telecommunications Equipment

Netherlands

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The Netherlands' telecommunications equipment market is projected to rise from $543 million[1] in 1981 to $678 million in 1987, pushed by dramatic increases in sales of video and radio broadcasting and data communications equipment (see table 1). The telecommunications monopoly held by the Dutch Posterijen, Telegrafie en Telefonie (PTT) has been mirrored on the supply side of the market by the dominant position of N.V. Philips B.V. The PTT's absolute control, particularly in the interconnect segment, is now under official scrutiny, and the introduction of second sourcing in the late 1970's has culminated in a massive joint venture between Philips and ATT International, a U.S.-based subsidiary of American Telephone & Telegraph. This essentially closed market is showing signs of long-term accessibility, and selected opportunities for U.S. exporters can be identified. Subscriber/user premises, data communications, and test and measurement equipment show good potential for manufacturers of sophisticated products. U.S. vendors are already well established in the mobile radio market. Good future prospects are indicated by the coming of digital switching and transmission systems and the development of fiber-optic transmission lines.

Competitive Environment

Domestic manufacturers supplied 68 percent of the telecommunications equipment market in 1981 and are forecast to capture 66 percent of sales in 1987. Philips, the leading supplier, had 1980 sales of nearly $16 billion worldwide, including $5 billion in telecommunications equipment. Founded in 1891, Philips employs nearly 350,000 workers; its 13 product divisions are involved in virtually every phase of electrical and electronics manufacturing. The firm's 64 affiliates around the world help market products, systems, and services to 130 countries, and its research and development staff numbers nearly 4,000 scientists. Because of its innovations in technology, Philips frequently assists the PTT with telecommunications planning even when other manufacturers ultimately supply the equipment. The Philips/ATT partnership will have important implications for the Dutch telephone and telex, transmission, and data communications equipment segments, especially in the long term.

Ericsson Telefoonmaatschoppij B.V., a subsidiary of the Swedish L.M. Ericsson group, was established in 1922. It employs nearly 1,000 workers at five locations and had gross sales in 1981 of $120 million. Nederlandsche Standard Electric Mij B.V., an affiliate of the U.S. giant International Telephone & Telegraph (ITT), has about 900 employees, one-third of whom are involved with telecommunications manufacturing. Hirschmann Electronica B.V. serves as another important domestic source.

Table 1.—The Netherlands: The market for telecommunications equipment, 1980-81 and projected 1987 (in millions of U.S. dollars)

	1980	1981	Projected 1987
Telephone and telex equipment			
Local production	340.6	378.5	419
Imports	138.9	90.1	121
Exports (less)	102.7	152.1	183
Total	376.8	316.5	357
Transmission equipment			
Local production	377.7	272.7	395
Imports	114.2	78.2	76
Exports (less)	331.5	216.2	324
Total	160.4	134.7	147
Mobile radio			
Local production	25.8	29.5	11
Imports	72.7	44.1	71
Exports (less)	47.1	34.1	39
Total	51.4	39.5	43
Video and radio broadcasting equipment			
Local production	32.9	26.3	59
Imports	13.0	12.5	15
Exports (less)	26.4	15.2	16
Total	19.5	23.6	58
Data communications equipment			
Local production	54.9	45.1	92
Imports	9.3	5.7	16
Exports (less)	33.1	21.9	35
Total	31.1	28.9	73
Total market			
Local production	831.9	752.1	976
Imports	348.1	230.6	299
Exports (less)	540.8	439.5	597
Total	639.2	543.2	678

Source: Monthly Foreign Trade Statistics by Commodity, Central Bureau of Statistics, The Hague, December 1980, December 1981; PTT Jaarverslag 1981; Netherlands Budget Memorandum, 1982; personal interviews; and International Trade Administration, Office of Trade Information Services research study, "International Market Research Brief on Communications Equipment—The Netherlands" (see Additional Information box).

Source: "International Market Research Brief on Communications Equipment—the Netherlands," Alan Stratford and Associates Ltd., Chobham, England (09905) 7822, November 1982, prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box), and desk research.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = 1.99 Dutch guilders (1980), and 2.50 guilders (1981 and subsequent years). Values through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1981 constant dollars.

U.S. firms have to compete both with these impressive domestic producers and with manufacturers from the Netherlands' fellow members of the European Economic Community (EEC), who are exempt from the import tariffs that add as much as 12 percent to the cost of U.S. goods. Not surprisingly, U.S. imports of less than $7 million accounted for barely 1 percent of imported telecommunications equipment in 1981 (see table 2). While U.S. sales are expected to more than double to $15.5 million in 1987, they will still account for little more than 2 percent of imports. U.S. manufacturers of telecommunications components should see eventual sales benefits from the Philips/ATT collaboration.

Table 2.—The Netherlands: Imports of telecommunications equipment by country of origin, 1981 and projected 1987 (in thousands of U.S. dollars)

	1981	Projected 1987
Telephone and telex equipment		
United States	413	1,609
Belgium/Luxembourg	29,482	
Sweden	21,852	
Germany	14,596	
Singapore	10,119	
Other	13,632	
Total	90,094	121,427
Transmission equipment		
United States	3,569	5,650
Germany	41,274	
Belgium/Luxembourg	14,734	
Ireland	4,024	
Sweden	2,597	
Other	11,988	
Total	78,186	76,328
Mobile radio		
United States	1,668	5,677
Germany	18,996	
United Kingdom	7,270	
Japan	4,024	
Singapore	2,924	
Other	9,209	
Total	44,091	70,744
Video and radio broadcasting equipment		
United States	591	1,041
Japan	6,518	
Germany	2,197	
France	1,024	
United Kingdom	1,011	
Other	1,147	
Total	12,488	14,653
Data communications equipment		
United States	382	1,527
Belgium/Luxembourg	1,797	
France	1,088	
United Kingdom	652	
Norway	451	
Other	1,328	
Total	5,698	16,078

Source: Monthly Foreign Trade Statistics by Commodity, December 1981, and International Trade Administration, Office of Trade Information Services, research study, "International Market Research Brief on Communications Equipment—the Netherlands."

The Netherlands' geographical neighbors have cornered nearly 30 percent of its telecommunications equipment market, with Germany getting about half that share. Imports from Siemens, AEG-Telefunken, Bosch-Fernseh, Pfitzner, and other German companies amounted to more than $75 million in 1981, with sales concentrated in transmission and mobile radio equipment. Two Belgian subsidiaries of U.S. firms captured more than 8 percent of the market in 1981. Bell Telephone Manufacturing Company S.A. of Antwerp sold more than $29 million worth of telex exchange equipment, while General Telephone & Electronics (GTE) sold nearly $15 million worth of pulse-code modulation (PCM) equipment. STC (an ITT subsidiary), Marconi, Neve, and Racal-Milgo, all U.K. suppliers, had about $8 million in Dutch telecommunications equipment sales in 1981. The PTT's proposed Viditel system, which uses the telephone network to distribute information for display on TV screens, is based on equipment developed by GEC and British Telecom and should add to U.K. firms' import share in the next several years. (Leading suppliers from all countries are listed at the end of this report.)

Product Market Profiles

Telephone and telex equipment.—The Netherlands' market for telephone and telex equipment is projected to expand from $316.5 million in 1981 to about $357 million in 1987 (see table 3). Both public networks are rapidly reaching the point at which demand will be satisfied. The market for public exchanges and other equipment will therefore be mainly for replacement and modernization of the existing systems rather than for expansion.

Switches and switching systems purchases are forecast to grow from $210 million in 1981 to more than $230 million in 1987. Philips, the dominant supplier for public switching exchanges, is currently furnishing stored-program-controlled (SPC) exchanges to replace the older electromechanical equipment. Ericsson has recently introduced its own SPC exchange to compete with that of Philips. The new Philips/ATT venture will convert and upgrade Bell System (United States) switching equipment for the European market, and plans eventually to develop and manufacture digital switching systems.

Table 3.—The Netherlands: The market for telecommunications equipment by product category, 1981 and projected 1987 (in thousands of U.S. dollars)

	1981		Projected 1987	
	Units	US$	Units	US$
Telephone and telex equipment				
Switches and switching systems	206,000	210,472	234,174	231,994
Subscriber/user premises equipment	344,797	69,630	391,965	83,872
Other telephone and central office equipment	—	11,394	—	12,660
Telex equipment	1,200	25,004	1,364	28,802
Category total		316,500		357,328
Transmission equipment				
Wire and cable	27,598	100,290	24,919	111,329
HF radio	—	—	—	—
Microwave	—	23,693	—	23,693
Lightwave	—	2,692	—	3,096
Multiplexers	1,366	7,942	978	9,154
Category total		134,617		147,272
Mobile radio				
Conventional mobile radio	17,100	21,696	13,238	16,796
Mobile telephones	4,840	7,509	7,796	12,093
Paging systems	5,190	2,806	10,454	5,651
Marine	5,100	7,232	5,657	8,022
Air-ground communications	40	277	40	277
Category total		39,520		42,839
Video and radio broadcasting equipment				
Closed circuit television	1,842	1,087	4,527	2,514
Radio broadcast transmitters	—	3,260	—	6,436
Television broadcast transmitters	—	8,587	—	15,212
Antenna towers	—	333	—	995
Radio studio equipment	8	2,680	24	11,076
Video studio equipment	6	7,600	13	22,153
Category total		23,547		58,386
Data communications equipment				
Concentrators	144	1,940	226	2,866
Modems	1,814	16,241	5,513	49,352
Multiplexers	62	637	144	1,390
Switching equipment	600	6,254	1,791	13,724
Other equipment	—	3,880	—	5,212
Category total		28,952		72,544

Source: Monthly Foreign Trade Statistics by Commodity, Central Bureau of Statistics, The Hague December 1981; PTT Jaarverslag 1981 (Annual Report, published 1982); The Dutch Telecommunications Service in Brief, PTT 1982; and International Trade Administration, Office of Trade Information Services, research study, "International Market Research Brief on Communications Equipment—The Netherlands."

Sales of subscriber/user premises equipment approached $70 million in 1981 and should come close to $84 million in 1987. Philips controls 90 percent of the private automatic branch exchange (PABX) market, with Ericsson and ITT sharing the remainder. Ericsson supplies about 60 percent of telephone instruments with ITT taking a 24-percent share. The remainder are imported, although all such equipment must meet rigid PTT standards. Pushbutton sets are rapidly replacing dial equipment.

While the PTT supplies all public telephone equipment, it does not have a monopoly over peripheral equipment such as recorders, answerers, encrypters, cordless phones, and the like. The Dutch police force, for example, purchases 500 encrypters each year for its own use.

Facsimile equipment may be obtained from both the PTT and private sources. A boost to the system came from the PTT's decision to provide facsimile equipment to post offices, and by March 1981 some 200 terminals had been installed. Philips and Siemens supply most facsimile equipment at present.

The telex system is monopolized by the PTT. The telephone, telex, and data communications networks all use the same PTT transmission system but have their own exchanges. Integration of the three networks awaits digitalization of transmission and switching equipment, which is proceeding slowly. All telex exchanges have been obtained from Bell Telephone's Antwerp subsidiary, with teleprinters supplied by Siemens.

Transmission equipment.—The total market for telecommunications transmission equipment is expected to increase from $134 million in 1981 to $147.3 million in 1987. The PTT enjoys complete control over the transmission network for telex and public telephones, consisting at present primarily of metal cable. Dutch railroads and electric utilities are permitted to maintain their own cable networks, but other agencies such as fire, police, and the armed forces employ the PTT cables. Cable is supplied mainly by the Philips subsidiary NKF Groep B.V., a major transmission equipment manufacturer with 11,000 workers and gross sales of $700 million in 1980. Philips/ATT expects to enter the transmission systems market as well. Siemens stands out in cable sales also.

Microwave transmission provides some interdistrict connections and also links the Netherlands to Germany and Belgium. Philips supplied most of the microwave equipment in the past, but now Siemens, Marelli (Italy), and GTE Telecomunicazioni (Italy) have also entered the market. The

PTT has expressed interest in U.S. and other firms' high technology in this area as well.

Both frequency-division multiplexing (FDM) and PCM are employed in the telephone system. Since PCM equipment is compatible with SPC exchanges, it is gradually replacing FDM gear used with electromechanical exchanges. In turn PCM will likely be replaced with time-division multiplexers (TDM) when the system is updated to digital transmission. Some TDM equipment is already in use in the telex network. The multiplexer market is expected to grow from not quite $8 million in 1981 to more than $9 million in 1987.

The introduction of coaxial cable into the primary network will bring additional technological change. At present, coaxial submarine cable, supplied by STC, connects Holland with Denmark and Great Britain. A trial run of compartmentalized coaxial cable (devised by NKF) has been in service between Arnhem and Ede since 1980.

Similarly, fiber-optic cable is being tested between Einhoven and Helmond in a joint PTT/Philips project. If the fiber-optic cable proves successful, the PTT may decide to go with it rather than with coaxial cable, a development that might favor U.S. firms, which are more familiar with fiber-optic technology than most European telecommunications manufacturers. American suppliers with competitive advantages here will nevertheless require local support, either through a Dutch subsidiary for production or by an agreement to manufacture with an existing Netherlands firm.

Mobile radio.—Sales of mobile radio equipment are forecast to climb only slightly between 1981 and 1987, from $39.5 million to $43 million. The PTT not only sets technical standards for mobile radio, but allocates frequencies through its Radiocontroledienst (Radio Control Services) and markets mobile telephones and paging systems in competition with commercial suppliers.

Sales of conventional mobile radio equipment are expected to decline with the growing use of mobile telephones. The PTT has awarded Ericsson a $10 million contract for a new mobile telephone switching system capable of handling 30,000 mobiles. A market of 8,000 automobile telephones a year is anticipated as a result.

The Politieverbindingsdienst, the central buying and maintenance department for the Netherlands' 140 regional police forces, expects to make yearly purchases of 1,000 portable, 3,000 mobile, and 700 base station radios. Each of the country's 50 regional fire authorities buys its own equipment, based on advice from the Ministry for Home Affairs Inspector of Fire Services. The national fire force annually purchases some 3,500 units of mobile equipment, primarily in the conventional mobile radio category. Motorola (United States) and Storno (Denmark) each take 30 percent of these sales. The fire authorities' interests in the future are expected to progress to advanced mobile telephone systems, automatic call diverters, and call monitors.

Netherlands Railways are embarked on a 5-year program to furnish all trains with mobile radios, a system that will require 25 control centers, 160 base stations, and 2,000 mobile radios. The contractor for the project has not yet been announced.

Philips competes in the expanding market for pagers, which is likely to double to almost $6 million between 1981 and 1987, although Motorola and the German firms have gained wide acceptance. The Dutch manufacturer shares ship-to-shore communications equipment with Pfitzner and Marconi. Philips controls the small air-ground communications market as the principal supplier to the Rijksluchtvaartdienst (RLD—Department of Civil Aviation).

This sector represents the only major instance of reexporting in the Dutch communications market, with a portion of the imported equipment as well as most domestic production being shipped abroad. Imports therefore dominate the mobile radio market, with Motorola holding a 25-percent share. The German firms AEG-Telefunken and Bosch-Fernseh follow closely behind, with Pfitzner gaining rapidly by virtue of competitive pricing and close attention to Dutch end-user specifications.

Video and radio broadcasting equipment.—The overall market for broadcasting equipment is expected to more than double from $23.5 million in 1981 to $58 million in 1987, with all varieties of equipment showing increased sales. The PTT, working through Nederlandse Omroep Zender Maatschappy (NOZEMA), purchases the broadcast transmitters for the state-owned radio and TV company, Nederlandse Omroep Stichting (NOS), and generally favors Philips and AEG-Telefunken.

NOS purchases its studio equipment and cameras independently, but generally buys from Philips or from firms in EEC countries. U.S. firms must pay import tariffs that raise their prices to an uncompetitive level. Neve supplies consoles for TV and radio studios. A recent $25 million contract to refurbish the television studios went to Philips (cameras) and Bosch-Fernseh (studio equipment).

Cable radio and TV is widespread in the Netherlands, covering more than 70 percent of the country. NKF, Siemens, and AEG-Telefunken supply cable and amplifiers to this market segment, which is dominated by the Casema system.

A major project to install a two-way cable TV system for electronic banking and shopping in the province of Limburg will begin in 1983. The Dutch Ministry of Economic Affairs has committed $25 million to the effort as part of its program to encourage innovation in Dutch industry.

Closed-circuit TV (CCTV) sales should more than double from $1 million in 1981 to $2.5 million in 1987. CCTV is used primarily by industry for security and control, and here the U.S. firm Fairchild and Eumig (Germany) have gained a good share of the market.

NOS has recently liberalized its policy on TV commercials to include privately produced spots. A number of advertising firms are expected to join existing producers in meeting needs for commercials and will eventually form perhaps 10 percent of the market for video equipment. These customers will buy from any supplier that offers good performance for the money; thus far, however, the only U.S. company to have gained a share of this market is RCA (TV cameras).

The only other area of promise to U.S. manufacturers is the eventual introduction of fiber-optic cable to replace conventional broadcast cable. Again, U.S. firms' advanced fiber-optic technology will give them the opportunity to exploit this market.

Data communications equipment.—The Netherlands market for data communications equipment is projected to leap from less than $29 million in 1981 to $73 million in 1987. Since the PTT has a monopoly over all data communications (except in-house services in industry), suppliers must deal with strict PTT requirements and the tendency to prefer local sources, particularly Philips. The PTT's newly established Datanet 1 packet-switched data network was supplied with switching systems, multiplexers, and modems under a $24 million contract to ITT. Follow-on contracts to be issued in 1983 are believed destined for Siemens.

Modems, whose sales are expected to treble from $16 million in 1981 to almost $50 million in 1987, represent the major data communications equipment that can be purchased directly by the end-user. Racal-Milgo has garnered a 25-percent share of the modem market in competition with Philips. U.S. companies, particularly through sales of associated computer equipment, enjoy good visibility and can expect an increased share. IBM (United States), acting through its subsidiary IBM Nederland, demonstrates such participation. The PTT, which must approve all modems used, also competes with other suppliers in offering these items for sale.

When the PTT replaces analog with digital switching on its public data communications network, firms with advanced digital technology might be able to replace the domestic ITT as suppliers. This change is not expected before 1985 at the earliest, however.

Communications test and measurement equipment.—Sales of test and measurement devices are expected to increase from $2.9 million in 1981 to nearly $4.5 million in 1987. As the PTT, which buys about 70 percent of this equipment, converts from analog to digital transmission and switching, the required testing and measurement devices will similarly change. Bit error performance testers, transient recorders, interface testers, multimeters, and remote monitors for data transmission lines are projected to be in demand. Imports dominate the market with sales by U.S. firms expected to nearly double from $1 million in 1981 to $1.8 million in 1987. Philips stands as the only domestic supplier of note.

End-User Profiles

PTT.—The main thrust in the Dutch telecommunications equipment market is replacing old materials and instruments with sophisticated modern products. The country's extensively developed telecommunications systems are ripe for advanced technology, and the Government is studying its future telecommunications role in the European space navigation program. The PTT is by far the largest buyer of telecommunications equipment in the Netherlands, with responsibility for approximately 90 percent of the total market in 1981 (see table 4). Because the PTT generally sets technical standards for all telecommunications equipment sold in the country, its influence pervades all sectors of the industry. Banking and commercial end users rank a distant second in a field that also includes police and fire authorities, industrial firms, broadcasting organizations, and highway, rail, air, and port transportation systems. Between 1960 and 1980, the number of telephone subscribers increased from 1.4 million to nearly 5 million. Well over 85 percent of the households have telephone service and, despite a new subscriber's often 2-month wait for a connection, the telephone authority expects to attain virtually 100 percent penetration by 1986.

Administratively, the PTT is under the jurisdiction of the Minister for Transport and Public Works. All its operating profits are paid into investment funds controlled by the Ministry, which in turn releases earnings from these funds to finance capital expenditures by the PTT. No commercial financing is permitted. Any outlay beyond the earnings of the investment funds must come from the Government's budget.

Table 4.—The Netherlands: The market for telecommunications equipment by major end-user sector, 1981 and projected 1987 (in thousands of U.S. dollars)

	Number of users	1981	Projected 1987
PTT	1	378,978	448,223
Banking and commercial	1,891	42,936	66,612
Police and fire authorities	192	22,171	24,033
Industrial	1,100	21,468	33,306
Broadcasting	57	13,766	25,279
Transport	85	10,000	7,000
Civil aviation	21	2,276	2,505
Port authorities	7	2,087	618
Others	—	49,458	70,802
Total		543,140	678,368

Source: The Dutch Telecommunications Service in Brief, PTT 1982, and International Trade Administration, Office of Trade Information Services, research study, "International Market Research Brief on Communications Equipment—The Netherlands."

The PTT is made up of three operational departments: Posts, Money Services, and Telecommunications. Periodically, administrators suggest separating the post office from the other operations, but in practice the profits from telecommunications more than offset the losses suffered by the postal operations so that the PTT shows a net profit. At the end of 1980, the Telecommunications Department had 27,400 employees, of whom 24,100 worked in the nation's 13 telephone districts. The 1980 turnover was approximately $2 billion, with a net operating profit of nearly $145 million (see table 5).

The PTT's monopoly on telecommunications equipment and services may shift, however. The government-sponsored Swarttouw Committee of public- and private-sector members has recommended decontroling subscriber equipment. The Committee's proposals have not yet been adopted, and opening up of the industry is not an immediate possibility.

Radio and television broadcasting.—The Government controls public broadcasting through NOS, with headquarters in Hilversum. Studios and production equipment are provided to a series of independent program-making organizations, allocating transmission time on the basis of the number of their subscribers. Two color television channels broadcast on ultrahigh frequency (uhf) to an estimated 8 or 9 million viewers. The four FM radio stations serve nearly 10 million radio listeners. NOS also operates Radio Nederland, which transmits programs worldwide.

Table 5.—The Netherlands: National telecommunications network, 1981

Number of telephones	
Business	2,042,000
Domestic	4,500,000
Main stations	5,102,000
Main station waiting list	55,800
Number of key systems	
2-15 lines	115,240
15- lines	57,600
Number of PABX's	
Analog	25,000
Digital	—
Number of lines	
Main	5,928,000
Toll trunk	3,306
International trunk	10
Number of exchanges	
Local	
Manual/electromechanical	1,149
Analog electronic	231
Digital electronic	—
Toll	
Manual/electromechanical	100
Analog electronic	39
Digital electronic	—
International	
Manual/electromechanical	4
Analog electronic	—
Digital electronic	—
Number of telephone calls	
Local	2,625,000,000
Toll	2,232,000,000
International	91,600,000
Number of telex subscriber lines	35,500
Switching capacity	45,000
Waiting list for lines	60
Minutes logged	
Domestic	525,000
International	537,000
Number of data terminals on systems	7,959
Number of dedicated lines for datacommunications	5,000
PTT	
Total employees (telecommunications only)	28,000
Total revenues	$3,737,840,000
Value of capital equipment purchased	$582,040,000
Total budget	
Construction budget	$600,400,000
Operating budget (all divisions)	$3,409,200,000

Source: PTT Jaarverslag 1981, PTT 1982; The Telecommunications Service in Brief, PTT 1982; and Eurodata Foundation Yearbook 1982, Eurodata Foundation, London 1982.

NOS finances equipment and facilities not provided with PTT funds through revenues from TV and radio licensing. The broadcasting organization has a program of refurbishing its radio and TV studios on a rotating basis.

Casema, a totally owned subsidiary of the PTT, dominates the cable TV scene, with 56 separate networks in operation reaching 2.5 million people. Several local authorities also operate cable systems, but their market share is relatively small.

Banking and commercial.—Banking and financial institutions employed almost one-fifth of the Netherlands' work force in 1981. They are all important users of telecommunications equipment and are expected to require improved technology in the future. The four main banks in the nation had combined net profits of $572 million in 1980, while the six main insurance groups enjoyed combined net profits of $388 million.

Holland's leading bank, ABN, uses some 250 PABX's and more than 300 data transmission lines to serve two computer centers and 65 offices. An additional 160 offices are fed by a branch network from this central system. ABN has installed the IBM 200 series computer system and uses Honeywell modems.

Police and fire authorities.—The police force is organized into 140 regional stations serving towns of more than 25,000 population, plus a government unit covering the rural areas. Combined forces total 25,000 police and 16,000 vehicles using 10,000 personal mobiles and 5,000 base stations. The police also have a data distribution system using PTT lines to link 700 telex terminals throughout the country. The fire service is organized into 50 separate regional authorities employing 3,700 full-time and 22,700 part-time firemen, with 1,343 vehicles.

Industrial.—The industrial sector employs nearly 1 million workers and contributes one-fourth of the gross national product. Dutch industries bought more than $20 million worth of telecommunications equipment in 1981, primarily PABX's and modems and other data communications gear. Philips, the electronics firm; Royal Dutch Shell, the petroleum company; and Unilever, which provides foodstuffs and domestic consumables; dominate the industrial scene.

Transport.—Transport and communications services employed 6 percent of the work force and spent $10 million on telecommunications equipment in 1981. The Netherlands has more than 1,375 miles of highways, with an additional 500 miles planned. The 1982 road budget totaled $185 million. All highways will be equipped with emergency telephones and automated traffic control systems. The 2,700 miles of navigable waterways are also important for transporting goods. Almost all vessels carry ship-to-shore radios. The national railways contain 1,800 miles of track and 300 stations. The completely electrified system carried more than 21 million tons of freight and nearly 200 million passengers in 1980. The railroads' annual budget for telecommunications, some $8 million, goes largely for an independent telephone system along the track to link all stations.

Civil aviation.—The main elements of civil aviation are the national airline KLM (Royal Dutch Airlines), Schiphol Airport near Amsterdam, and the RLD, which regulates aviation. KLM has a fleet of 55 jet aircraft, employs 14,000 people, and serves an international route network of 241,150 miles. A 4,000-extension Philips PABX serves its headquarters and the facilities at Schiphol. Most international communications are handled via telex links with the Societe International de Telecommunications Aeronautiques at Paris. A telex reservation system serves some 125 travel agents, and the system is expected to reach an additional 2,000 agents through the PTT's Viditel equipment.

Besides Schiphol, the Netherlands has 3 more international airports—Groningen, Maastricht, and Rotterdam—and 14 regional and smaller airports. Schiphol handled almost 10 million passengers and 330,000 tons of freight in 1981. A mobile radio network at Schiphol serves KLM, the airport authority, and the RLD, and is expected to add 150 mobile sets a year. The RLD provides all ground equipment for air-to-ground communications, and Schiphol authorities are responsible for procuring all ground radar and other ground support communications equipment for security, firefighting, and maintenance personnel.

Port authorities.—The main ports of Rotterdam, Amsterdam, Ijmunden, Terneuzen, and Vlissingen serve the Netherlands' waterways. In 1981 the Rotterdam complex handled more than 250 million tons of cargo, carried by 29,375 seagoing ships and 350,000 inland vessels. The Port Authority maintains a mobile radio system to link its 14 vessels and patrol boats and the 150 harbor pilots. It is about to introduce an automatic vessel traffic management system combining visual and radar tracking of ships with data communications. For visual tracking of ships, the system will employ 11 closed-circuit TV cameras from Philips. A data communications system with 120 video displays and 100 modems will connect the Port Authority control room, pilots' offices, and shipping agents. Facsimile equipment may be added later. The new system will also call for an expanded mobile radio network with 10 base stations, 50 mobile, and nearly 500 personal radios.

Marketing Practices

Sales channels.—Because the PTT requires all suppliers to have a domestic operating base in the Netherlands to provide logistical and aftersales services, most sales are channeled through multinational firms with extensive local operations, mainly Philips, L.M. Ericsson, and ITT, all of whom represent other manufacturers on the Dutch market. Siemens and AEG-Telefunken also have Dutch operations that have enabled them to become principal suppliers of telecommunications equipment in a locally dominated marketplace.

Another sales channel for imports involves Dutch companies' acting as manufacturers' agents. Koning en Hartmann, which represents Racal-Milgo and Storno, and Radio Holland, which distributes Motorola products, sell modems and mobile radio equipment directly to the end-user, often in competition with the PTT. End-users with offices abroad, notably KLM and Royal Dutch Shell, sometimes purchase telecommunications equipment directly from foreign manufacturers and import it themselves.

Procurement procedures.—The dominant position of the PTT establishes its contractual requirements as precedents that are followed by most other end-users. For major equipment purchases, the PTT sends requests for bids only to prequalified suppliers with substantial operating bases in the nation. Although not formally obligated to do so, the PTT and other governmental bodies inevitably look to Philips as first source of supply, followed by other Dutch and European companies.

All contracts for more than $277,500 must be publicized in the Supplement to the Official Journal of the EEC. The Government's chief purchasing agency, the Rijksinkoopbureau, also issues requests for offers for smaller equipment. English is an accepted language for doing business in the Netherlands, and tender or supporting documents need not be translated.

Delivery lead time and costs of importation do not appear to affect purchase decisions. The relatively high value of the equipment under consideration reduces the significance of transportation costs. Since the PTT and NOS can purchase only within their available budgets, credit terms are irrelevant for the majority of telecommunications equipment.

Advertising.—No trade shows are tailored specifically to the telecommunications market, but a number of related shows provide opportunities to display products. These include transport equipment shows, Firato (biennial international exhibition of radio, TV, and audio equipment), Fiarex (biennial electronics trade fair), and the Het Instrument show for professional electronic and electrical test and measurement equipment. Most trade shows are held in Amsterdam.

The only magazine of direct relevance, Kabelvisie, is devoted to both commercial and technical cable TV matters. The journal of the Netherlands Society of Chartered Engineers, PT Elektrotechnick Elektronica, covers a broad range of electrical and electronic subjects and provides an appropriate advertising medium for data communications systems. The most important method of sales promotion, however, remains direct contact with end-users. Wide use is made of symposiums and demonstration days for specifically invited end-users and of mailings to key personnel in positions to recommend suppliers.

Trade Restrictions

Importers from nations belonging to the EEC are exempt from any tariffs. Selected developing countries also enjoy exemption from import duties. Firms from other countries, including the United States, must pay tariffs ranging from 6 to 12 percent depending on the particular equipment, plus an 18-percent value-added tax. The import tariffs are subject to reductions under the Tokyo Round Agreements of the GATT.

No foreign exchange restrictions or import quotas impede imports. Licensing is required for certain imports, but none of the items included under telecommunications is affected. The value-added tax is payable on sales of all equipment, whether imported or domestically produced.

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Telephone and telex equipment		
Ericsson	Netherlands	Telephone sets, PABX's, key systems
ITT	Netherlands	Telephone sets
Philips	Netherlands	Stored program controlled (SPC) exchanges, PABX's, facsimile equipment
Bell Telephone Manufacturing Company	Belgium	Telex exchanges
Siemens	Germany	Facsimile equipment
Transmission equipment		
ITT	Netherlands	PCM equipment
NKF Groep	Netherlands	Cable
Philips	Netherlands	Microwave equipment, PCM equipment, fiber-optic systems
Databit	United States	PCM equipment
GTE	Belgium	PCM equipment
GTE Telecommunicazioni	Italy	Microwave equipment
Marielli	Italy	Microwave equipment
Siemens	Germany	Cable, microwave equipment, PCM equipment
STC	United Kingdom	Submarine coaxial cable
Mobile radio		
Philips	Netherlands	Air-ground communication
Motorola	United States	Paging systems, V/UHF mobile radio
AEG-Telefunken	Germany	V/UHF mobile radio, mobile telephones paging systems, HF marine radio
Bosch-Fernseh	Germany	VHF mobile radio, mobile telephones paging systems
L.M. Ericsson	Sweden	Mobile telephones
Marconi	United Kingdom	Marine HF and VHF radio
Pfitzner	Germany	V/UHF mobile radio, V/UHF air-ground radio
Storno	Denmark	V/UHF mobile radio, UHF maritime radio

Name	Country(ies) of Manufacture	Type of Equipment
Video and radio broadcasting equipment		
Hirschmann Electronica	Netherlands	Cable systems, antennae
Philips	Netherlands	Transmitters, cameras, broadcasting equipment
Fairchild	United States	Closed-circuit TV
RCA	United States	TV cameras
AEG Telefunken	Germany	Cable transmission systems, TV and radio broadcast transmitters
Bosch-Fernseh	Germany	TV cameras, studio equipment
Eunig	Germany	Closed-circuit TV
Neve	United Kingdom	TV and radio studio consoles
Siemens	Germany	Cable and amplifiers for cable networks
Studer	Switzerland	Radio studio equipment
Test and measurement equipment		
Datalab	United States	Waveform analyzers, transient recorders
Farnell	United States	Radio test equipment, signal generators
Fluke	United States	Multimeters
Hewlett-Packard	United States	Multimeters, data line analyzers, interface test equipment, signal generators, digital signal test equipment
Keithley	United States	Multimeters
Tektronix	United States	CRO's, digital data monitors
Mitsu	Japan	Selective level transmission set
Siemens	Germany	PCM systems analyzers, microwave test equipment
Takeda-Riken	Japan	Spectrum analyzers
Wandel and Goltermann	Germany	Interface tester, selective level monitor
Data communications equipment		
ITT	Netherlands	Switching systems, multiplexers, modems
Philips	Netherlands	Modems
IBM	United States	Modems
Racal-Milgo	United Kingdom	Modems

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AT URBANA-CHAMPAIGN

Country Market Survey

Computers and Peripheral Equipment

Belgium

U.S. DEPARTMENT OF COMMERCE
nternational Trade Administration

Primed by a backlog of demand in retailing and health care as well as growth in data communications networks, Belgium's market for computers and peripheral equipment is forecast to expand at a vigorous 12 percent a year. Sales are projected to advance from $429.7 million[1] in 1980 to $840 million in 1986 (see table 1). This market registered strong growth in recent years despite the nation's sluggish economy; it is expected to sustain its performance as depressed profit margins force many Belgian managers to invest in larger, more advanced EDP installations to pull labor costs down and productivity up. Belgians are already sophisticated EDP users, applying their substantial computer population to everything from bookkeeping to industrial process control and consumer buying. As a result, trade sources project demand for a tremendous variety of add-on peripheral devices, U.S. vendors' strongest suit. Overall EDP hardware sales by American suppliers stood at $148.4 million in 1980 and are expected to reach $252 million in 1986 (see table 2).

Export-oriented domestic manufacturers produce a limited range of equipment, so more than 85 percent of the computers and peripherals changing hands in Belgium is imported. Sales of imported EDP equipment to Belgian end-users (excluding re-exports) stood at $379 million in 1980 and are forecast to rise to $730 million in 1986. Moreover, its location in the heart of the European Economic Community (EEC) makes Belgium an entrepot for neighboring markets. Twenty percent of imported EDP equipment and over 60 percent of home production are destined for foreign markets. Some $105.9 million worth of equipment was re-exported in 1980 with $130 million expected in 1986. Domestic output is projected at $280 million in 1986 including exports of $170 million. U.S. manufacturers are the leading import suppliers. In addition to nearly 9 percent annual growth in sales of U.S.-built equipment, several American companies also expect to ship a rising volume of EDP hardware to Belgium from their subsidiaries in Europe.

Demand for minicomputers is increasing faster than overall market growth, with sales forecast to rise 15 percent annually from $49.5 million in 1980 to $115 million in 1986. Rapid expansion is foreseen in the use of mini's for commercial, laboratory, and process control applications; the price/performance ratio and operating ease of these units favorably impress Belgian end-users. Acceptance of distributed intelligence is also enhancing demand for minicomputers. Since the market for small, medium, and large computer systems may be approaching saturation, a 7 percent annual increase is expected in sales of these systems ($85 million in 1986). Sales of add-on peripheral equipment in 1980 amounted to $324.3 million, 75 percent of the entire market. As user interest in peripherals broadens, low-cost devices will have exceptional sales potential. Strong demand is anticipated throughout the 1980-86 period for add-on memories, data entry and output devices, and terminals of all types. Total peripheral sales are projected at $640 million in 1986.

Table 1.—Belgium: The market[1] for computers and peripheral equipment, 1980, 1981, and 1986
(in millions of U.S. dollars)

	1980	1981	1986
Minicomputers			
Production	19.2	20.1	45
Imports	70.6	75.0	130
Exports[2]	40.3	32.5	60
Market size	49.5	62.6	115
Small, medium, and large computer systems			
Production	42.2	43.6	60
Imports	74.1	60.4	80
Exports	60.4	42.3	55
Market size	55.9	61.7	85
Peripherals (sold separately)[3]			
Production	92.1	96.3	175
Imports	340.2	400.1	650
Exports	108.0	120.0	185
Market size	324.3	376.4	640
Totals			
Production	153.5	160.0	280
Imports	484.9	535.5	860
Exports	208.7	194.8	300
Market Size	429.7	500.7	840

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Belgian exports include both domestically built equipment and previously imported equipment.

[3] Excluding equipment sold as components of integrated computer systems.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Belgium" (see Additional Information box). Figures in this report are based on data gathered in Belgium, including available government statistics, industry reports, and trade source estimates and projections.

Manufacturing.—Manufacturing firms, making up Belgium's largest end-user sector, are projected to spend $240 million on EDP equipment in 1986, reflecting growth of about 11 percent a year (see table 3). The sector's 55,000 establishments employ some 1.3 million workers. Manufacturers accounted for about 45 percent of the medium and large computer systems in use in 1980 and had 6,500 minicomputers (see table 4).

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[1] All values are shown in U.S. dollars. Local currency data for all years are converted at the exchange rate of US$1 = BF29.24. Values for years through 1980 are expressed in current rather than constant dollars/prices; values for 1981 and subsequent years are expressed in 1980 constant dollars/prices.

High labor costs are prompting intensified use of EDP throughout manufacturing. In several industries, plans are underway to modernize and further automate production. Accounting and administrative procedures are routinely handled by computers in all but the smallest manufacturing firms. In their factory modernization programs, several users are introducing terminals that capture data at the source to improve and speed up cost accounting and management decisionmaking. Belgium's increasingly important process industries are equipping plants with advanced control instrumentation, including direct digital control as well as distributed intelligence. Modernization plans among iron and steel companies include computer control for blast furnaces and continuous casting. Both computer-aided manufacture (CAM) and computer-aided design (CAD) are gaining wide acceptance in machine building. End-users in this sector will require a full range of computers and peripheral equipment during 1980-86, with exceptional demand anticipated for small computers and terminals. Software requirements are also expected to expand significantly during this period.

Banking and finance.—Spending by the banking and finance sector for computers and peripheral equipment could increase 10 percent a year, bringing outlays to $140 million in 1986. Several banks have combined efforts to provide Belgium with a highly advanced electronic funds transfer (EFT) system. Year-end figures for 1980 indicate that the 120 banking and financial institutions, employing a total of about 70,000 people, had 300 computer systems and 2,000 minicomputers in operation. Paperless transactions and automated tellers characterize the sector's EDP techniques. Most bank records are saved on microfiches prepared with computer output on microfiche

Table 2.—Belgium: Imports of computers and peripheral equipment[1] by country of origin, 1980, 1981, and 1986

	1980		1981		1986	
	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)
Minicomputers						
United States	20.50	29.0	20.8	27.7	37	29
Germany	24.70	35.0	26.6	35.5		
United kingdom	7.80	11.0	8.6	11.5		
France	3.80	5.4	3.4	4.5		
Japan	.70	1.0	.8	1.1		
Other	13.10	18.6	14.8	19.7		
Subtotal	70.60	100.0	75.0	100.0	130	100
Small, medium, and large computer systems						
United States	25.80	34.8	16.1	26.7	20	25
Germany	17.10	23.1	15.8	26.2		
France	6.80	9.2	9.1	15.1		
United Kingdom	7.90	10.7	3.3	5.5		
Japan	—	—	.3	0.5		
Other	16.50	22.2	15.8	26.0		
Subtotal	74.10	100.0	60.4	100.0	80	100
Peripherals (imported separately)[2]						
United Stsates	102.10	30.0	115.5	28.9	195	30
France	58.40	17.2	74.8	18.7		
Germany	63.20	18.6	69.0	17.2		
United Kingdom	45.00	13.2	54.4	13.6		
Japan	3.30	1.0	5.4	1.4		
Other	68.20	20.0	81.0	20.2		
Subtotal	340.20	100.0	400.1	100.0	650	100
Total imports	484.90		535.5		860	
Total imports from U.S.	148.40		152.4		252	
U.S. share of total imports		30.6		28.5		29

[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

[2] Excluding equipment imported as components of integrated computer systems.

Source: See source notation of table 1.

Table 3.—Belgium: Expenditures[1] for computers and peripheral equipment by major user sectors, 1980 and 1986

	1980		1986	
	Value ($ millions)	Percent of total	Value ($ millions)	Percent of total
Government	35.0	8.1	60	7.1
Manufacturing	130.0	30.2	240	28.6
Banking and finance	80.0	18.6	140	16.7
Insurance	20.0	4.7	35	4.2
Retailing and wholesaling	30.0	7.0	75	8.9
Transportation	25.0	5.8	50	5.9
Utilities	10.0	2.3	20	2.4
Communications	5.0	1.2	12	1.5
Health care	5.0	1.2	12	1.5
Education and research institutions	35.0	8.1	70	8.3
Publishing and printing	7.5	1.7	18	2.1
EDP service bureaus	35.0	8.1	78	9.2
Other	12.5	3.0	30	3.6
Total	430.0	100.0	840	100.0

[1] Excluding costs of software, hardware maintenance, sales commissions, etc.
Source: See source notation of table 1.

(COM) equipment. Further EDP applications are being explored by the sector's Centre Interbancaire de Recherche en Informatique.

Government.—The government sector, with some 88,000 employees, is expected to boost annual spending for EDP equipment to $60 million by 1986. Both central and regional governmental authorities have established committees to improve and promote EDP usage in their operations. Budget allocations for the central government alone include $140 million for new EDP equipment over the next 5 years.

Central government agencies have established 10 large data banks. One of the largest is used by internal revenue offices; each business enterprise has been assigned a tax code, permitting the automation of a multitude of statistical operations. City and regional governments are also important purchasers of EDP equipment; they maintain large processing centers which are also used by local hospitals and educational institutions. Computers from Siemens (Germany) and Philips (Netherlands) have long dominated public sector sales. To boost high-technology know-how and employment in Belgian industry, the central government offered purchasing preferences to these firms for establishing manufacturing subsidiaries in the country. Trade sources report, however, that end-users in government are now buying equipment from other mainframe manufacturers as well. Central and local government agencies utilized a total of 140 computer systems and 1,300 minicomputers in 1980. Government acquisitions over the next few years are expected to concentrate on terminals, small systems, minicomputers, add-on memories, and COM equipment.

Retailing and wholesaling.—Spectacular expansion is anticipated in EDP usage by retailers and wholesalers, whose spending for computers and peripheral equipment is expected to rise at the market pacing rate of nearly 17 percent a year, reaching $75 million in 1986. Point-of-sale (POS) terminals will spearhead this growth, with demand expected to focus on terminals capable of reading or identifying credit cards as well as conventional units. Optical character recognition (OCR) equipment should also be in considerable demand. Conventional POS terminals and cash registers that serve as stand-alone terminals are already used by some department stores and supermarkets. Most large chain stores operate medium or large computer systems for administration, stock control, and general management functions. Wholesalers are becoming increasingly important end-users, acquiring small business computers and systems based on small and medium mainframes for accounting and general management purposes. Some 350,000 people are employed in this sector.

Insurance.—Insurance companies are sophisticated end-users; their purchases of EDP equipment are expected to increase 10 percent a year, bringing spending to $35 million in 1986. Data processing installations in the insurance sector utilized 900 minicomputers and 115 larger systems in 1980. Data banks have been established by virtually all large companies, and keyboard terminals with cathode ray tube (CRT) displays are found in most workplaces. Terminals provide more than 20 percent of the sector's 40,000 employees with access to stored data. COM is widely employed, and EFT is generally used for premium collection.

EDP service bureaus.—Expenditures on computers and peripheral equipment by Belgian EDP service bureaus are expected to increase 14 percent a year from 1980, reaching $78 million in 1986. More than 100 independent service bureaus comprise this sector. Also included are numerous small establishments that provide only data entry services, transferring data from conventional records to disks or tapes in preparation for further processing elsewhere. EDP service bureaus used 175 mainframes and 1,000 mini's in 1980 and ranked second only to manufacturing in large-system installations. Demand for terminals is growing in this sector as more branch offices are being equipped for on-line and batch processing.

Education and research institutions.—In the education and research sector, annual EDP equipment budgets are forecast to rise from $35 million to $70 million in 1980-86, as networks are extended and training programs for computer specialists are expanded. Computer installations in 1980 included 10 large systems, 135 medium and small central processing units (CPU's), and 1,100 minicomputers. Over the next few years, demand from the research institutes associated with universities and government is expected to focus on very large high-performance mainframes; the principal suppliers are expected to include Amdahl, Control Data, and IBM. In research laboratories and other educational institutions, computer acquisitions will be in the small and medium system range. On-line terminal connections between educational facilities and regional computer centers are increasing, and many research institutes are expanding their connections with central data banks such as those available through Euronet.

Transportation.—End-users in the transportation sector are expected to double their expenditures for EDP equipment over the 5-year period, to $50 million in 1986. Most major transportation companies rely on extensive networks of mainframes and terminals, and strong demand is expected throughout this sector for such systems. The State-owned railroad's EDP investments have been aimed at improving productivity; it has computerized administrative tasks, installed electronic control for switching yards, and established a network for seat reservations. The Brussels airport and the airlines are advanced EDP users. Computers supervise seat reservations systems and technical maintenance programs at Sabena, the national airline. At Antwerp, operations in the port, on the quays, and in many warehouses are computer controlled. Other establishments in this sector, including travel agencies and freight forwarding agents, are providing growing sales opportunities for small business computers, on-line terminals, and custom-designed software.

Utilities.—Belgian utilities are expected to boost their EDP spending to $20 million a year in 1986. Some 62,000 workers are employed by public utilities in providing electricity, gas, and water service as well as wastewater treatment. End-users in this sector employ EDP for commercial accounting, including customer billing and fee collection through banks or the postal checking account system. Power stations have the latest in process control equipment; gas and electricity distribution involve extensive use of computerized telemetry.

Communications.—The principal end-users in the communications sector are the Regie des Telegraphes et des Telephones (RTT), responsible for telephone, telegraph, telex, and data communications services, and the Regie des Postes, providing mail and checking account services. In this small but rapidly growing market segment, spending for computer equipment is expected to increase at the rate of 16 percent a year, to $12 million in 1986. RTT purchases consist largely of data communication and transmission equipment. Demand for these devices should rise as the agency's data networks expand. The post office runs computer centers for its own administration and for customer checking accounts. It competes with banks with Postomat, its cash dispenser service, and is considering use of EDP techniques for mail sorting.

Other sectors.—In the health care and publishing/printing sectors, expenditures for EDP equipment are forecast to increase at above market rates in 1980-86. Trade sources report that a demand backlog has developed in health care, where spending for computers and peripheral equipment is expected to increase 16 percent a year, reaching a level of $12 million in 1986. Health care professionals in Belgium are only beginning to expand EDP usage beyond administrative applications. Considerable growth potential is foreseen for installation of CPU's and terminals in doctors' offices and for more EDP usage in hospitals to handle medical records and to administer patient care and drug prescriptions. Increased demand for laboratory computers is anticipated from large clinical laboratories. In addition, the data banks that are being established for pharmaceutical products and medical literature should boost demand for terminals in this sector. While EDP is employed for accounting and administrative operations in pub-

Table 4.—Belgium: Cumulative number of installed computers,[1] by major user sector, as of December 31, 1980

	Mini-computers	Small computers	Medium computers	Large computers
Government	1,300	60	60	20
Manufacturing	6,500	270	400	100
Banking and finance	2,000	160	120	20
Insurance	900	60	45	10
Retailing and wholesaling	1,500	55	40	5
Transportation	1,000	30	15	5
Utilities	350	25	10	5
Communications	250	20	10	5
Health care	200	10	5	—
Education and research institutions	1,100	60	75	10
Publishing and printing	300	30	15	—
EDP service bureaus	1,000	75	60	40
Other	600	45	25	—
Total	17,000	900	880	220

[1] Computer size is based on the purchase price of the CPU, as follows: minicomputers, less than $150,000; small computers, $150,000-$500,000; medium computers, $500,000-$1.5 million; and large computers, more than $1.5 million.

Source: See source notation of table 1.

lishing and printing, union resistance has slowed application of computerized composing techniques. Trade sources indicate, however, that union opposition to editing terminals and other electronic composing devices is waning, and printing plants of all sizes are expected to make substantial expenditures for this equipment in 1980-86. An increase of about 16 percent a year is forecast for the sector's purchases of computers and peripheral equipment, bringing expenditures to $18 million in 1986.

Major Market Trends

Business and commercial data processing account for most computer use in Belgium, (see tables 5 and 6) absorbing 86 percent of processing time for minicomputers and at least 70 percent for small, medium, and large systems. Industrial control applications rank next in importance for minicomputers and are significant for small and medium systems as well. Education and scientific and engineering problem solving are particularly important in large system applications. Data communications absorb 5 to 10 percent of processing time for medium size systems, up to 5 percent for large and small systems, and 2 percent for minicomputers. Other trends influencing EDP equipment purchases are highlighted below.

Minicomputers.—Burgeoning growth is expected in the early 1980's in Belgium's minicomputer population, bringing more than 40,000 units into operation by 1986 (see table 7). Sales are forecast to increase at the rate of 15 percent a year through 1986. Small business computers and mini's for laboratory and process control applications are expected to spearhead this growth. Considerable demand is also anticipated for combined word and data processing units and for personal computers. Most minicomputers are acquired as systems complete with peripherals, but they are also in demand for use as terminals in large networks.

Table 5.—Belgium: Percentage breakdown of total installed minicomputers[1] by end-user applications, 1980

		Percent of total
Business/commercial data processing		86
Industrial control		6
Continuous process control	4.5	
Direct machine control	0.5	
Factory management	0.5	
Other	0.5	
Data communications		2
Terminal controllers	0.6	
Front end systems	0.3	
Message circuit switching	0.3	
Data concentrators	0.8	
Laboratory analysis		3
Medical sciences	1.2	
Other life sciences	1.0	
Physical sciences	0.8	
Total		100

[1] Minicomputers are defined as those having a CPU priced at under $150,000.
Source: See source notation of table 1.

Table 6.—Belgium: Percentage breakdown of total processing time of installed small, medium, and large computers[1] by end-user application, 1980

	Small computers	Medium computers	Large computers
Business/commercial data processing	70-80	70-80	70-80
Industrial automation/process control	5-10	5-10	0-5
Scientific/engineering applications	0-5	0-5	5-10
Military/aerospace applications	0-5	0-5	0-5
Data communications/teleprocessing	0-5	5-10	0-5
Medical/scientific lab analysis	5-10	0-5	0-5
Education, instruction	5-10	5-10	10-15
Other	5-10	5-10	0-5

[1] Computer size is based on the purchase price of the CPU, as follows: small computers, $150,000-$500,000; medium computers, $500,000-$1.5 million; and large computers, more than $1.5 million.
Source: See source notation of table 1.

Table 7.—Belgium: Population of computers, by size[1] 1980 and 1986

	1980		1986	
	Number of units	Percent of total	Number of units	Percent of total
Minicomputers	17,000	89.5	40,000	93.0
Small computers	900	5.0	1,600	4.0
Medium computers	880	4.5	1,150	2.5
Large computers	220	1.0	250	0.5
Total	19,000	100.0	43,000	100.0

[1] Computer size is based on the purchase price of the CPU, as follows: minicomputers, less than $150,000; small computers, $150,000-$500,000; medium computers, $500,000-$1.5 million; and large computers, more than $1.5 million.
Source: See source notation of table 1.

System size.—Trends in recent years indicate that small and large systems are gaining preference in Belgian computer installations. While the number of medium sized systems is expected to increase to 1,150 by 1986, their relative importance in the nation's computer population is declining. In some of the largest end-user sectors, particularly banking, insurance, and manufacturing, demand tends to focus either on configurations designed around a large mainframe or on networks backed by several small CPU's. Small systems have users in virtually all sectors; unit sales are expected to increase about 10 percent a year during 1980-86, with a population of 1,600 projected for 1986. The major users of large systems are manufacturing, service bureaus, government, and banking. The "jumbo" systems suited for R&D will find buyers in both the manufacturing and government sectors in the first half of the 1980's. A total of 250 large systems are expected to be in operation by 1986.

System acquisition.—An estimated 30 percent of all installed computers (50 to 60 percent by value) in Belgium are rented or leased. In new installations, where small computers are becoming more prevalent, the trend is toward purchases. Belgian end-users are beginning to shop around more for peripheral equipment and often purchase from sources other than mainframe manufacturers. Mixed-brand computer systems are offered by several system houses. Most buyers of multisource equipment specify full plug-in IBM compatibility.

Add-on storage/memories.—Several devices in this category are demonstrating good sales potential. Magnetic tape drives for conventional tapes, cassettes, and cartridges are highly regarded by end-users in insurance, government, and utilities. Belgian demand for diskette drives is expanding rapidly with the proliferation of small systems and minicomputers. Demand for semiconductor memories is rising as cost-conscious end-users are attracted to the easy and reliable access these devices provide to stored data. Limited use is made at present of magnetic bubble memories.

Data entry.—Belgian demand for all types of keyboard devices is expected to remain steady. But system planners recognize the economy and efficiency of automated input techniques and willingly employ them wherever large data volume or other circumstances dictate. OCR devices, in particular, are gaining broad acceptance in the banking and finance sector, and applications are growing in government, utilities, and the postal service.

Data output.—Work stations equipped with CRT displays, both alphanumeric and graphic, are multiplying rapidly, and these units should continue to enjoy excellent sales potential. Also in demand are low and medium-speed printers, particularly equipment suited for use with small computers. Sales prospects are expanding for laser and other nonimpact printers. End-users in utilities, construction, manufacturing, and engineering are expected to step up their purchases of graphic displays and plotters.

Terminals.—Exceptional demand is anticipated for virtually all types of terminals in the early 1980's. Expansion of networks providing Belgian users with direct access to central data banks is contributing significantly to this demand. The use of point-of-transaction terminals is expanding in several sectors; factory data collection, financial, and POS terminals should all sell well in coming years. Dedicated special-purpose transaction terminals are employed by Belgian airlines, travel agencies, and banks.

Automated banking and business systems.—Through the Belgian Association of Banks, the banking sector is making use of the latest in EDP technology, which in turn is boosting equipment demand among bank customers. Businesses can cut costs through EFT by computerizing their own financial operations or hiring an EDP service bureau. Exchange of data carriers is handled through the Centre d'Echange d'Operations a Compenser. Thirty-six banks are also connected to the international Society of Worldwide Interbank Financial Telecommunication (SWIFT), which has an operations center in Brussels.

While teller terminals are not yet common, 350 cash dispenser terminals are available to banking customers. Using DOM 80, an automatic bill payer system, customers can authorize the bank to pay utility bills, insurance premiums, and rent or mortgage payments directly from their checking accounts.

Belgian banks are pioneering in the use of "plastic money" with two systems, Mr. Cash and Bancontact. Specially designed POS terminals are installed in 350 gas stations; customers can make immediate payment from their bank accounts by inserting their magnetic cards in the terminals. A few retail stores have also installed the equipment. If designers can make the two systems compatible, the attractiveness of plastic money should increase.

Data communications.—Rapid expansion is expected in teleprocessing in Belgium. Some 13,000 modems were in use in 1980, and trade sources anticipate at least double that number will be required by 1986. While both batch and on-line applications are increasing, remote on-line applications are regarded as having the greatest growth potential.

Belgium's data communications networks are widening rapidly. An annual increase of 20 percent is expected over the next few years in the number of subscribers, who currently total about 10,000. A variety of data communications facilities are available through the RTT's public telephone network. Telex service provides transmission at up to 50 baud. Datel provides international communication at up to 2,400 bits per second (bps) (simplex, half-duplex, and duplex). Data Communication Service offers access to data banks connected to American and Canadian networks (maximum speed of 1,200 bps). The European network, Euronet, operates at speeds ranging from 110 to 1,200 bps. The RTT is planning a network of some 1,500 terminals and 11 centers controlled by a head station in Brussels, for the new packet switched service launched in 1982. Transmission at 2,400, 4,800, and 9,600 bps are provided.

Modems up to 2,400 bps must be leased from the RTT; the principal suppliers are Siemens (up to 1,200 bps) and Racal-Milgo (2,400 bps). For high-speed modems, RTT has approved more than 70 models that correspond to the more than 70 CCITT V 22 standard. End-users can buy or lease these directly from modem manufacturers. The leading suppliers of high-speed modems are Burroughs, Codex, CII-HB (France), IBM, Nixdorf (Germany), Racal-Milgo (U.K.), and Texas Instruments.

Software.—Expenditures for software in 1980 were estimated at $250 million; approximately 60 percent of this sum went for applications software and 40 percent for system software invoiced separately. Increases on the order of 15 to 20 percent a year are expected in spending for software during the early 1980's. End-user in-house personnel have developed close to half of the software in use; 35-40 percent was provided by mainframe suppliers; and about 20 percent came from software houses.

Considerable demand exists for standard programs designed for specific end-user sectors (banking, hospitals, retail trade, etc.) and functions (general accounting, inventory management, etc.). The importance of standard packages has increased with the growth in popularity of small computers. Both mainframe manufacturers and software houses are beginning to offer more modular programs. An estimated 60 percent of all programs are written in COBOL; ASSEMBLER accounts for at least 20 percent, chiefly those used in large systems; and FORTRAN is employed in another 10 to 20 percent. More use of BASIC is anticipated with the rise in sales of simple computer systems.

Demand for data base management systems (DBMS) is increasing rapidly. Most purchasers of DBMS use the mainframe manufacturer's software (Burroughs, Honeywell, IBM, NCR, Siemens, and Univac); Cincom also holds a sizable share of the DBMS market in Belgium. The principal suppliers of telecommunications monitors are IBM and Cincom; Sesa Benelux (France), also offers this equipment. For other systems and applications packages, IBM is the leading supplier, and Cincom holds a good market position with its systems for use with IBM hardware.

EDP manpower.—An estimated 60,000 people were involved in data processing activities in 1980; EDP specialists totaled some 7,000, including an estimated 3,000 operators, 1,800 programmers, 800 program analysts, and 1,400 systems analysts. This pool of specialized manpower is expected to expand to 12,000 by 1986. But many sectors expect personnel shortages since highly qualified professionals tend to seek employment with mainframers and software houses. Shortages of software development specialists have already become evident.

Competitive Environment

Imports thoroughly dominate the Belgian market, accounting for over 75 percent of computer sales in 1980 and 90 percent of all peripherals. U.S. sources have attained a strong position in this market. Direct U.S. sales, valued at $148.4 million in 1980, 30 percent of imports, are expected to reach $252 million by 1986. In addition, a number of American companies supply computers and peripherals to Belgium from subsidiaries throughout Europe, including Belgium itself (see table 8). U.S. brands accounted for an estimated 80 percent of all installed computers in 1980 (see table 9) and about 75 percent of new sales.

Peripherals made up nearly 70 percent of direct U.S. sales in 1980. U.S.-made CRT's, disk drives, printers, plotters, and terminals are highly competitive on the Belgian market in terms of technology, functional design, and price. While market shares for imports cannot be determined precisely because of re-export activity, it appears that at least a quarter of the peripherals sold to Belgian end-users are of U.S. origin. Among the peripherals with good sales potential for U.S. manufacturers are transaction-oriented terminals and add-on memory devices, including integrated circuit memories and drives for fixed and changeable disks, floppy disks, and tape. Among data entry and output devices, U.S.-made key-to-disk and key-to-tape systems, CRT console systems and workstations, COM devices, graphic plotters, laser printers, and optical readers should enjoy good sales opportunities in the early 1980's. U.S. sales of peripheral equipment are projected at $195 million in 1986.

U.S. companies are the sales leaders for small, medium, and large computer systems, but most of those computers are supplied from subsidiaries within the EEC. Trade sources expect that direct U.S. sales of these systems will decline to $20 million in 1986 as American firms pursue the advantages (e.g., less worry over currency fluctuations; compliance with EEC regulations) of manufacturing within the Common Market. For minicomputers, an increase of 10 percent a year is forecast for U.S. shipments, bringing the value of this trade to $37 million in 1986. Combined word and data processing units are important in these

Table 8.—Major suppliers of computers and peripheral equipment to the Belgian market

Domestic manufacturers

- Acec
  - OEM manufacturer of computers, peripherals
- AEG-Telefunken[1]
  - Computerized process controls
- Ampex[2]
  - Peripherals
- Applied Magnetics Belgium
  - OEM manufacturer of peripherals
- Barco Electronic
  - OEM manufacturer of peripherals
- Burroughs[2]
  - Small and medium computers
- Clare International
  - OEM manufacturer of peripherals
- ETAP
  - OEM manufacturer of computers, computerized word processing systems
- Gillam
  - OEM manufacturer of peripherals
- ITT Data Equipment & Systems[2]
  - Data communications equipment, terminals
- Mecatherm
  - OEM manufacturer of computers, peripherals
- Memorex[2]
  - Disk drives
- Philips[3]
  - System components
- Sait Electronics
  - OEM manufacturer of computers, peripherals
- Siemens[1]
  - System components

U.S. Manufacturers

- Amdahl
  - Computers
- Ampex
  - Tape and disk drives
- Apple
  - Desk-top computers
- Applied Digital Data Systems
  - Terminals, CRT's
- Beehive
  - Terminals
- Bell & Howell
  - Small computer systems
- Bunker Ramo
  - Terminals
- Burroughs
  - Full line of computers
- Centronix
  - Printers
- Codex
  - Modems
- Commodore
  - Desk-top computers
- Control Data Corp.
  - Full line of computers
- Data General
  - Minicomputers
- DatagraphiX
  - COM equipment
- Diablo
  - Terminals
- Digital Equipment Corp.
  - Minicomputers
- Foxboro
  - Minicomputers
- General Automation
  - Minicomputers
- Hazeltine
  - Peripherals
- Hewlett-Packard
  - Small business computers
- Honeywell
  - Process control computers
- IBM
  - Full line of computers
- Inforex
  - Data entry systems, terminals
- ITT Data Equipment & Systems
  - Peripherals
- Kodak
  - COM equipment
- Management Assistance Inc.
  - Small computers
- Memorex
  - Memories, disk drives
- ModComp
  - Minicomputers
- Mohawk Data Sciences
  - Terminals, data entry systems
- NCR
  - Small business computers, small and medium computers, terminals
- Perkin-Elmer
  - Terminals
- Pertec
  - Disk drives
- Prime Computers
  - Small and minicomputers
- Shugart
  - Peripherals
- Tandy
  - Desk-top computers
- Teletype
  - Peripherals
- Tektronix
  - Graphic displays
- Texas Instruments
  - Peripherals, small business computers
- 3M
  - COM equipment
- Univac
  - Full line of computers
- Wang
  - Small and minicomputers

Con.—Third-Country Manufacturers

- AEG-Telefunken (Germany)
  - Process control computers
- BASF (Germany)
  - Data storage systems, computers
- CTM Computertechnik Muller (Germany)
  - Small business computers
- Digital Equipment Corp. (Germany)[2]
  - Minicomputers
- Hewlett-Packard (Germany)[2]
  - Minicomputers
- IBM (Germany)[2]
  - Full line of computers
- Kienzle (Germany)
  - Small business computers
- Mergenthaler Linotype (Germany)[2]
  - Computerized composing equipment
- Nixdorf (Germany)
  - Small computers, small business computers
- Olympia (Germany)
  - Office computers
- Philips (Germany)[3]
  - Minicomputers
- Siemens (Germany)
  - Full line of computers
- Triumph-Adler (Germany)
  - Small business computers
- CII-HB (Honeywell) (France)[2]
  - Full line of computers
- Dassault (France)
  - Terminals
- Intertechnique (France)
  - Process control computers
- LogAbax (France)[4]
  - Computers, peripherals
- Matra (France)
  - Terminals
- Thomson CSF (France)
  - Terminals
- Burroughs (United Kingdom)[2]
  - Full line of computers
- Ferranti (United Kingdom)
  - Process control computers
- IBM (United Kingdom)[2]
  - Full line of computers
- ICL (United Kingdom)
  - Full line of computers
- Racal-Milgo (United Kingdom)
  - Modems
- Univac (United Kingdom)[2]
  - Large computers
- Daisy (AES) (Netherlands)[5]
  - Minicomputers
- Management Assistance Inc. (Netherlands)[2]
  - Medium computers
- Philips (Netherlands)
  - Peripherals
- Tektronix (Netherlands)[2]
  - Peripherals
- IBM (Italy)[2]
  - Small business computers
- Olivetti (Italy)[2]
  - Small business computers
- Hasler (Switzerland)
  - Terminals
- Hermes Precisa (Olivetti) (Switzerland)[4]
  - Process control computers
- Kontron (Switzerland)
  - Minicomputers
- Datasaab (Sweden)
  - Small business computers, terminals
- Facit (Sweden)
  - Terminals
- Hitachi (Japan)
  - Large computers
- Sanyo (Japan)
  - Minicomputers
- Sharp (Japan)
  - Small computers
- Toshiba (Japan)
  - Minicomputers
- AES (Canada)
  - Computerized word processing systems
- Data 100 (Northern Telecom) (Canada)
  - Computers

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[1] German-owned subsidiary

[2] U.S.-owned subsidiary

[3] Dutch-owned subsidiary

[4] Italian-owned subsidiary

[5] Canadian-owned subsidiary

Source: See source notation of table 1.

sales. U.S. brands of minicomputers for process control, laboratory, and medical applications also sell well in Belgium.

A number of major U.S. manufacturers participate in the Belgian market. Companies with substantial sales in recent years include IBM, Burroughs, Univac, Wang Laboratories, Hewlett-Packard, NCR, and Digital Equipment Corporation (DEC). IBM is the acknowledged market leader; its total Belgian revenues exceeded $400 million in 1980 with sales and rentals of EDP equipment and related services accounting for about 70 percent of this sum. In 1980, IBM installations, including about 1,200 units worth $675 million, accounted for well over a third of Belgium's computer base by value. Univac and Burroughs each supplied approximately 6 percent, and NCR, about 4 percent.

U.S. manufacturers are expected to hold their own despite mounting competition in all segments of this market. U.S. suppliers have proven their

Table 9.—Belgium: Cumulative number and value[1] of installed computers, by major suppliers, as of December 31, 1980

	Number of units	Value ($ millions)	Share of total value (%)
IBM	1,200	675	35.8
CII-HB (France)	500	150	8.0
Siemens (Germany)	300	140	7.3
Univac	200	125	6.6
Burroughs	1,900	110	5.8
NCR	2,000	75	4.0
ICL (U.K.)	600	55	2.9
Digital Equipment Corp.	800	45	2.4
Nixdorf (Germany)	700	45	2.4
Philips (Netherlands)	1,700	45	2.4
Olivetti (Italy)	1,700	35	1.9
LogAbax (France)	1,000	35	1.9
Hewlett-Packard	600	25	1.3
Management Assistance Inc.	400	25	1.3
Others	5,400	300	16.0
Total	19,000	1,885	100.0

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

Source: See source notation of table 1.

marketing skills in Belgium, and their products generally enjoy established reputations for reliability and advanced technology. Strong product support has also contributed to U.S. sales success. Trade sources suggest American companies could strengthen their sales efforts by using Belgian francs in price quotations and maintaining greater price stability for their products.

Third-country competition is led by German sources, who registered sales of $105 million in 1980, 22 percent of imports. Next are French ($69 million) and British ($60.7 million) suppliers. Dutch, Japanese, and Italian manufacturers are also important competitors. Included among the major third-country suppliers are several subsidiaries of U.S. companies. Trade sources estimate that half of the German, French, and British shipments to Belgium come from U.S.-owned plants.

In the market for minicomputers, German manufacturers are strong competitors, providing about 35 percent of Belgium's imports; Nixdorf and Keinzle are well-established suppliers for small business and office units. Mini's from Philips (Netherlands), Olivetti (Italy), and LogAbax (France) have also done well in this market. Japanese manufacturers have only recently begun to ship office computers to Belgium. End-users of process control mini's appreciate the system engineering and software provided by German (AEG-Telefunken), British (Ferranti), and French (Intertechnique) manufacturers of this equipment.

The full range of small, medium, and large computer systems is offered by Siemens (Germany), CII-HB (France), and ICL (U.K.). Hitachi (Japan) is a recent market entrant, having recently sold a large system to the leading public utility in Brussels through its marketing representative, BASF (Germany).

Numerous European suppliers compete with peripheral equipment. France recently replaced Germany as Belgium's second largest supplier after the United States. Terminals and optical readers are offered by many sources. French and German firms have done particularly well with automated bank tellers, and German manufacturers have been successful with both high-speed laser printers and low-speed printing devices.

Domestic manufacturers supplied 12 percent of the Belgian market in 1980 and are expected to maintain approximately that share through 1986. Belgian output of computers and peripheral equipment, valued at $153.5 million in 1980, is projected to reach $280 million in 1986. Peripherals account for well over half of production. Some 2,000 to 3,000 people are employed in this industry. Seven foreign-owned subsidiaries are the principal manufacturers; the largest is Burroughs, producing an estimated $50 million worth of small and medium size computers in Belgium annually. Together the subsidiaries of Burroughs, Siemens, ITT, and Philips account for nearly two-thirds of Belgian output. Ampex (U.S.), Memorex (U.S.), and AEG-Telefunken (Germany) each had output in the $5 million range in 1980. Trade sources do not anticipate major production increases from these foreign firms because of Belgium's relatively high labor costs. The industry also includes several Belgian-owned systems houses and engineering firms that assemble computer systems from OEM suppliers, adding some of their own equipment and developing the necessary software. Earnings for services account for most of the income of these firms, few of which have more than 100 employees. Trade sources estimate these firms sell up to $5 million worth of computers and related equipment annually.

Additional Information

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
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Washington, D.C. 20230

The Survey summarizes a 66-page International Market Research (IMR) report prepared by Dr. Karl-Wilhelm Kindel in Berlin under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Belgium and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
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Country Market Survey

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Graphic Industries

France

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

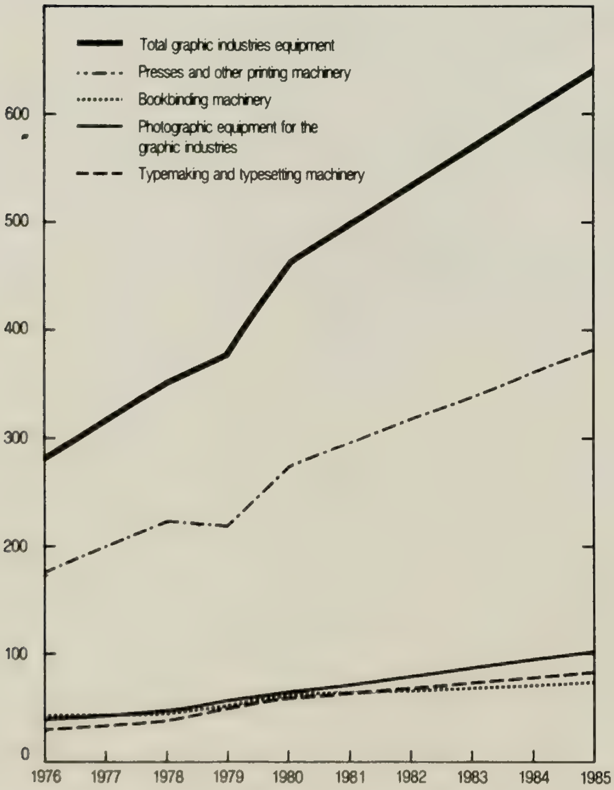
Faced with ever-rising labor and social security costs, French printers are expected to increase their purchases of graphic industries equipment from \$459 million[1] in 1980 to \$642 million in 1985 (see table 1 and figure 1). The general economic slowdown is forecast to hold market growth to a moderate 7-percent average annual rate, down from the rapid 13 percent of the 1976-80 period.

Typemaking and typesetting machinery.—Sales of typemaking and typesetting equipment are expected to increase by a stable 7 percent annually, from \$59 million in 1980 to \$84 million in 1985, as printers continually upgrade their equipment. During the late 1970's manual typesetting methods almost completely disappeared in France for newspapers, journals, books, and brochures. Computerized phototypesetting systems took over, proliferating dramatically from about 1,300 units in 1976 to approximately 3,800 at the end of 1979. With most of the large and medium-sized printers already equipped with photocomposers, the market is somewhat saturated, and demand will probably taper off to more moderate levels. Sales potential however, remains good for the following products:

Tape-driven phototypesetters with cathode ray tube (CRT)
Processing systems (page layout systems and/or multistation copy entry)
Keyboard data entry machines
Video display terminals (VDT's)
Remote entry devices
Direct entry phototypesetting machines
Offset platemaking equipment

Figure 1.—France: the market for graphic industries equipment 1976-85

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research study.

In order to compete successfully, larger printers expect to replace some existing machinery with more advanced phototypesetters such as tape-driven machines with CRT's, to improve quality and speed. Newspapers are moving to more sophisticated photocomposition for display ads and full page layouts and to multistation copy entry systems that enable them to speed up production and computerize customer invoicing. Video display input devices and keyboard data entry machines, which enable printers to use their phototypesetters at full capacity, are attractive in terms of costs and improved work quality. Remote entry devices also have good sales potential, particularly for local correspondents of large newspapers.

Demand for entire new typemaking and typesetting systems is expected primarily from smaller enterprises that have not yet switched over to phototypesetting techniques. For these firms, the flexible and less expensive direct entry phototypesetting machines should be popular. As a result of new developments in offset technology, steady demand is forecast for offset platemaking equipment.

Photographic equipment.—The market for photographic equipment for graphics is expected to climb by almost 10 percent annually to \$102 million in 1985. Strong demand is anticipated for:

Scanners
Process cameras
Automatic film processors
Lighting systems
Quality control equipment

With an ever-increasing market for color printing, publishers plan to add to the approximately 200 scanners already installed in 1981. The trend to offset printing is bolstering the demand for other photographic prepress items such as cameras, film processors and lighting equipment. Although many firms would like to do away with film, French print-

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[1] All values are shown in U.S. dollars; local currency data are converted at the following exchange rates: US\$1=F4.78 (1976), F4.51 (1978), F4.25 (1979), F4.23 (1980) and \$F4.23 (1985).

Table 1.—France: The market[1] for graphic industries equipment, 1976, 1978-80, and 1985

(in millions of U.S. dollars)

	1976	1978	1979	1980	1985
Typemaking and typesetting[2] machinery					
Production	4.9	5.9	7.6	10.2	13
Imports	27.1	39.7	50.6	58.9	85
Exports	5.9	7.9	8.8	9.8	14
Market size	26.1	37.7	49.4	59.3	84
Photographic equipment for the graphic industries					
Production	7.5	8.4	9.5	10.6	13
Imports	38.6	47.8	61.8	69.3	130
Exports	6.1	8.9	14.2	16.0	41
Market size	40.0	47.3	57.1	63.9	102
Presses and other printing machinery					
Production	100.4	122.0	164.7	200.9	331
Imports	98.9	151.4	134.8	163.0	200
Exports	27.2	53.3	82.1	90.2	150
Market size	172.1	220.1	217.4	273.7	381
Bookbinding machinery					
Production	33.5	31.0	35.3	37.8	35
Imports	10.4	15.1	18.5	25.9	42
Exports	.7	1.4	2.4	1.4	2
Market size	43.2	44.7	51.4	62.3	75
Totals					
Production	146.3	167.3	217.1	259.5	392
Imports	175.0	254.0	265.7	317.1	457
Exports	39.9	71.5	107.5	117.4	207
Market size	281.4	349.8	375.3	459.2	642

[1] Size of market equals production plus imports (c.i.f.) minus exports (f.o.b.). Other products, such as mailers, specialized materials handling equipment, quality control instruments, and pollution control equipment are not included in market size figures, although these items are discussed in other sections. Parts and accessories such as printing plates, blocks, type, etc. are excluded.

[2] The value of dedicated computers and related equipment that are not integrated into printing equipment is excluded from statistics in this table and tables 3 and 7.

Source: International Trade Administration, Office of Trade Information Services research study, The Market for Graphic Industries Equipment—France (see Additional Information box).

ers feel that the technology necessary for other types of reliable systems to do sophisticated layouts probably won't be available for 8-10 years. Consequently, film and film processors should find a good market in the meantime. The evolution toward highly sophisticated machines heightens the importance of photographic quality control equipment, including light integrating meters, densitometers, and "dark field" illumination boxes.

Presses and other printing machinery.—French publishers, whose investments in presses and other printing machinery grew at a frenetic 12-percent annual rate during 1976-80, expect to slow their buying somewhat, with purchases increasing at just under 7 percent yearly from $274 million in 1980 to $381 million in 1985. Equipment expected to be in demand includes:

Offset presses
Flexographic printing presses
Label printing presses

Flexographic and label printing presses, both used for package printing, are projected to be especially popular as packaging demands increase. Offset presses have been in strong demand in the past several years for both color and black and white printing, and sales of both sheet-fed and web-fed offset presses are expected to climb an average 10 percent annually between 1979 and 1985 (see table 2). Demand for gravure presses is expected to be limited since they require lengthy preparation time and are not really profitable in the French market with its relatively short press runs.

Bookbinding machinery.—With no technological breakthroughs expected, sales of bookbinding machinery are forecast to rise by a modest 4 percent annually to more than $75 million in 1985. However, strong demand is expected for several binding and finishing items:

Adhesive binders
Automatic gluing and pasting equipment

Inserters (newspaper and commercial)
Collating and gathering machines

Adhesive binders and automatic gluing and pasting equipment are in demand for increasingly popular paperback publications, and inserters have good sales potential with the growth of advertising in newspapers and magazines. Faced with high labor costs, publishers are becoming more interested in automation for collating and gathering equipment and online bookbinding systems, which also enable them to reduce delivery times for magazines, newspapers, and advertising.

Miscellaneous equipment.—French companies are seeking high-performance materials handling equipment to match their high-output presses. In addition, the shortage of skilled craftsmen has forced many firms to adopt quality control instruments and ink-testing equipment to ensure high standards in the quality of printed matter. In the area of pollution control, noise suppression systems are becoming more popular.

Competitive Environment

Imports account for a significant 70 percent of the French market for graphic industries equipment and are expected to remain at that level through 1985. French end users are aware of the weakness of domestic manufacturers and do not hesitate to embrace foreign suppliers. Local production is forecast to increase by 8.5 percent a year in the 1980-85 period, slightly faster than the 7.5 percent annual growth predicted for imports, but increasing amounts of domestic products are slated for export.

Table 2.—France: Total market for selected types of graphic industries equipment, 1979 and 1985

(in millions of U.S. dollars)

	1979	1985
Direct entry phototypesetting machines	5.0	8
Tape driven phototypesetting machines without CRT	4.5	4
Tape driven phototypesetting machines with CRT	1.7	5
Keyboard data entry machines	2.0	3
Video display terminals	1.5	3
Photocomposition machines for display ads or full page layout	12.0	20
Multistation copy entry systems	8.0	15
Offset platemaking equipment	6.5	10
Process cameras	10.0	20
Lighting systems	6.8	9
Color separation scanners	11.0	25
Automatic film processors	10.0	15
Sheet-fed offset presses	70.0	120
Web-fed offset presses	90.0	170
Flexographic presses	12.0	24
Gravure presses	35.0	50
Quality control equipment	7.5	13
Materials handling equipment	10.0	20
Pollution control equipment	7.5	14

Source: See source notation of table 1.

German and U.S. manufacturers account for the major share of French imports, which are predicted to grow from $317 million in 1980 to $457 million in 1985. The fiercely competitive nature of the French market tends to hold import shares steady. Since Germany and France are both members of the European Economic Community (EEC), import duties are not imposed on German products. American products, however, are subject to duties ranging from 2.4 to 11.6 percent. An additional clearing tax of 2 percent of the relevant customs duty is levied on all imports.

U.S. position.—Overall, propelled by their record of technological achievements, American suppliers can look forward to sales of $97 million in 1985 (see table 3 and figure 2) or 20 percent of imports, with sales mounting an average 11 percent annually from 1979. French purchasers give high marks to the American products' price-to-performance ratio, reliability, speed and capacity. U.S. marketing practices and support activity, although not considered outstanding, are well-rated for items such as product exposure, delivery, and installation. However, the American vendor's reputation for parts availability and personnel training facilities lags behind his European competition. In addition, U.S. suppliers could improve their market position by allowing better credit terms to French printers and by being more flexible about adapting their standardized machines to specific French requirements.

The French printer tends to be loyal—once satisfied with a piece of equipment and its related services, he regularly orders from the same manufacturer, whether foreign or domestic—so a good first impression is important. American vendors trying to penetrate the French market should emphasize price, performance efficiency, and parts availability, factors that are more important to the French buyer than the supplier's country of origin.

Faced with strong competition from European suppliers, sales of typemaking and typesetting equipment by American vendors are forecast to drop from 37 percent of imports in 1979 to 30 percent in 1985. Still, sales are projected to reach a respectable $26 million in 1985. Because of the U.S. reputation for reliability in advanced technological systems, vendors can anticipate good sales opportunities for:

Remote entry devices
Display ad/page layout systems

Table 3.—France: Imports of graphic industries equipment by country of origin, 1976, 1979, and 1985
(in millions of U.S. dollars)

	1976	1979	1985
Typemaking and typesetting machinery			
United States	11.4	18.7	26
Germany	7.6	15.2	34
Other	8.1	16.7	25
Subtotal	27.1	50.6	85
Photographic equipment for the graphic industries			
United States	11.2	14.8	43
Germany	14.7	23.5	43
Other	12.7	23.5	44
Subtotal	38.6	61.8	130
Presses and other printing machinery			
United States	11.9	14.8	22
Germany	44.5	64.7	90
Switzerland	12.9	12.1	14
Italy	9.9	13.5	20
Other	19.7	29.7	54
Subtotal	98.9	134.8	200
Bookbinding machinery			
United States	1.0	3.3	6
Germany	5.4	8.7	21
Switzerland	2.8	3.5	7
Other	1.2	3.0	8
Subtotal	10.4	18.5	42
Total imports	175.0	265.7	457
Total imports from the U.S.	35.5	51.6	97

Source: See source notation of table 1.

Multistation copy entry systems
Photocomposition systems
Video display terminals
Keyboard entry devices

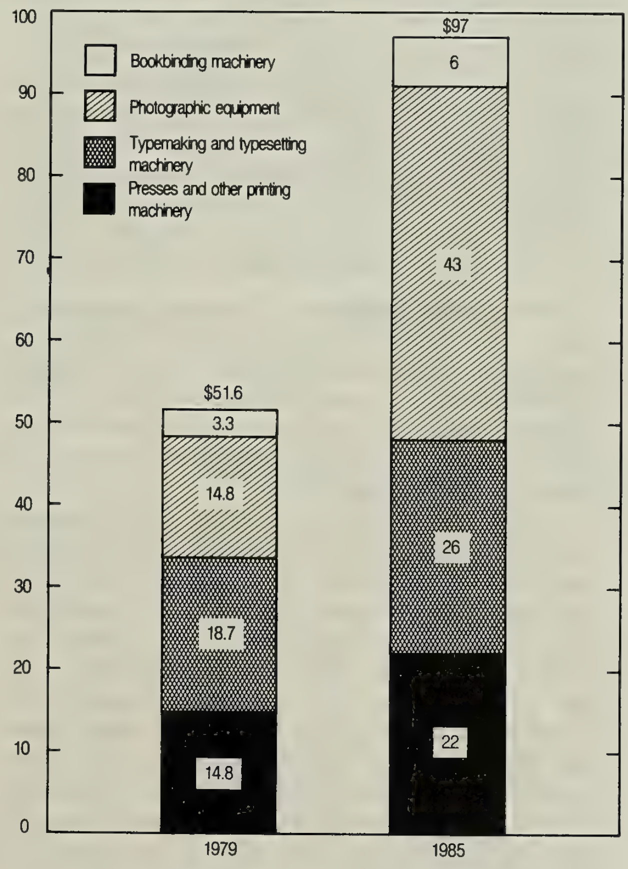
Manufacturers such as Harris Corp., AM Varityper (a subsidiary of A.M. International U.S.), and Compugraphic Corp. have good reputations for direct entry phototypesetting machines, tape-driven phototypesetting machines (with and without CRT's), keyboard data entry machines, and video display terminals. American manufacturers are known for their reliable products and services and competitive prices. Harris has gained a good reputation for its photocomposition equipment, and Compugraphic has been successful with its programmable composition systems. AM Varityper is competing successfully in direct entry machines.

Companies with expertise in automated equipment can expect to make strong inroads in the French market for photographic equipment for the graphic industries. Led by sales of cameras, automatic film processors, and quality control equipment for photographic devices, the U.S. share of imports is forecast to increase from 24 percent in 1979 to 33 percent in 1985. Sales of U.S.-made photographic equipment are projected to jump a dramatic 19 percent annually, approaching $43 million in 1985. Based on the strong reputation of American products, sales prospects are good for lighting systems and particularly favorable for process cameras. Kodak has an excellent reputation for its complete product line.

Purchases of U.S.-built presses and other printing machinery are projected to grow by just under 7 percent yearly to $22 million in 1985. No expansion is anticipated in the overall share of printing equipment imports claimed by American vendors, but sales prospects are good for offset and flexographic presses. With the continued move to offset printing, equipment makers can expect ongoing demand for web-fed presses from the French newspaper industry, which appreciates the reliability of American machinery for daily mass printing work. Harris is known for producing some of the finest presses. Rockwell is particularly appreciated by printers of

Figure 2.—France: U.S. sales of graphic industries equipment, 1979 and 1985

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research study.

newspapers and magazines for the reliability and flexibility of its equipment. AM Multigraphics is very competitive in supplying the smaller French printing plants.

The proliferation of packaging and labeling used in modern marketing presages a good market for flexographic and label printing presses, areas in which American companies have solid experience. U.S. manufacturers can expect to keep their share of gravure press sales, but the limited gravure market is not expected to grow.

Sales of bookbinding marchinery are forecast to grow by a steady 11 percent yearly to more than $6 million in 1985. Sales of American-made bookbinding equipment, which rose from 10 percent of imports in 1976 to 18 percent in 1979, are predicted to level out at about 14 percent in 1985, a healthy improvement over the 9-year period. Sales prospects are best for:

Complete bookbinding systems
Automatic gluing equipment
Collators and folders
Mailing equipment

American manufacturers have an excellent reputation for complete online bookbinding systems and fully automated collating and gathering machines. Harris and AM Multigraphs are well known in France for their binding and finishing equipment.

U.S. suppliers are expected to take a leading position in sales of miscellaneous equipment such as light-integrating meters, densitometers, ink-testing equipment and noise suppression systems. Technical standards are much more developed in the United States, where they are required by law, than in France, which has no specific national regulations.

Other foreign suppliers.—German manufacturers, clearly the major foreign suppliers, achieved their leadership with a combination of faultless technical know-how and a dynamic commercial policy. French end-users feel they can count on German manufacturers to provide equipment that is both reliable and adaptable to their needs.

German companies are making great strides in sales of typemaking and typesetting equipment. By concentrating on small phototypesetting machines, they expect to account for 40 percent of imports by 1985. The French appreciate the wide product line offered by German companies and find their products generally more adaptable to the requirements of the many small and medium-sized French printing establishments. Berthold, is known for phototypesetters and Klimsch for platemaking equipment.

In the overall photographic equipment category, German suppliers are projected to lose ground to highly advanced American-made products, dropping from 38 percent of imports in 1979 to 33 percent in 1985. But German firms such as Dr. Hell and Klimsch are strong competitors in the lucrative field of scanner sales.

With a good price/performance ratio, major German press manufacturers such as Heidelberg, MAN Roland, Albert Frankenthal Konig and Bauer, and Windmoeller and Hoelscher anticipate 1985 sales of $90 million, or 45 percent of press imports. German suppliers also expect to dominate the fast-growing field of bookbinding machinery imports. Their anticipated 1985 sales of $21 million account for half the projected bookbinding equipment imports. Since most suppliers share the same level of technological know-how, the German companies' leadership results, in part, from their aggressive marketing practices—particularly their diligent attention to parts availability and aftersales service. Kolbus (speed stitchers), Stahl (folders), and Polar (guillotines) are important German vendors.

Swiss manufacturers have traditionally offered superior products at high prices. Printers who are famous for high-quality work have been willing to pay premium prices for the guaranteed quality of Swiss equipment. But, with the present economic slowdown, many printers can no longer afford this luxury, and the Swiss share of imports is declining. Swiss sales of presses dropped from 13 percent of imports in 1976 to 9 percent in 1979 and are projected to decline to 7 percent in 1985. Bookbinding machinery sales are also expected to fall from 19 percent of imports in 1979 to 17 percent in 1985. Bobst (letterpress and flexographic equipment), Color Metal (offset and gravure presses), Gallus-Ruesch (adhesive binders) and Muller Martini (binding equipment) are leading suppliers.

Italian manufacturers are at the opposite end of the spectrum. They supply the French market with less expensive but slightly less reliable equipment and expect to hold their share of imports, since end-users are generally satisfied with the price/performance ratio. Suppliers such as Tecmo (web-fed presses), and Schiavi (flexographic presses) benefit from the relatively low prices and favorable exchange rate. These suppliers, together with the major Italian producers of rotary presses (Cerutti, Nebiolo, and OMCSA) expect sales of presses and other printing machinery to escalate from $13.5 million in 1979 to $20 million in 1985.

The U.K. share of the market has been declining since 1976 and is not expected to grow within the next 5 years, with the possible exception of scanner sales. Major U.K. vendors include Crosfield (scanners), Ludlow (cameras and typecasters), Crabtree-Vickers (web-fed and sheet-fed presses) and Baker-Perkins (letterpresses and lithopresses).

Domestic suppliers.—The 65 domestic manufacturers of graphic industries equipment employ about

3,000 workers, mostly in small plants. Sixteen firms accounted for 52 percent of French production in 1977.

Output is limited to a narrow range of products. Five of the seven major domestically owned firms concentrate on production of presses and other printing machinery: C.E.R. (screen process equipment), Machines Chambon (offset and specialized presses), Diffusion Contruction Mecanique (photogravure and flexographic presses), Creusot-Loire (offset presses), and Societe Nouvelle Seailles et Tison (special machines for continuous business forms printing). The other two dominant firms produce photographic equipment: Bouzard et Fils (cameras) and Vannier Photelec (enlargers, lighting systems, and light tables). No French firms manufacture photocomposition equipment.

A significant portion of domestic production is manufactured in France by subsidiaries of well-known U.S. firms such as Harris Intertype, A.M. International, and Compugraphic. Together with other major foreign firms operating in France (such as Bobst France, Miehle-Goss-Dexter, and Crosfield), these subsidiaries help satisfy local demand for sophisticated equipment such as phototypesetting machinery and stand-alone input devices and contribute substantially to French exports.

The limited size and scope of the French industry is due to its low research and development expenditures, which are far below those of American and German competitors. With competition on the international level now involving huge research expenditures, the generally small French companies can't afford to keep up and are not expected to catch up in the 1980-85 period.

As might be expected, exports by French companies are also somewhat limited in size and potential. Fairly traditional items such as hot metal typesetting machines, letterpresses, offset presses, and stitchers account for most of the exports.

The Printing Industry

Total sales of the 14,600 firms in the French printing industry are expected to rise by slightly under 8 percent a year, from almost $6.9 billion in 1979 to nearly $11 billion in 1985 (see table 4). Most of the growth will be due simply to inflation; the foreseeable economic and social factors that heighten or diminish demand for printed matter will probably balance out. On the negative side, with an average 1.7 children per family, the population growth rate is not expected to go up until 1985 or later, resulting in stable or even decreasing school enrollments. Unemployment and inflation may also dampen some demand for printed matter. On the positive side, the increasing number of women in the labor force translates into more disposable income available for reading materials. Likewise, the new Socialist Government's decision to reduce working hours will increase leisure time, further escalating consumption of printed products.

The French are net importers of printed products, with imports exceeding exports by $210 million in 1979. Since many French printers do not yet have enough modern equipment to offer competitive prices and reliable delivery times, they lose time-sensitive jobs to foreign printers, including half the magazine orders. The French printers who have modernized their equipment have found profitable markets at home.

Dramatic growth in general advertising sales,

Table 4.—France: Sales, number of firms, and number of employees of the printing industry, 1976, 1979, and 1985

	Sales (in US$ millions)			Number of firms			Number of employees (in thousands)		
	1976	1979	1985	1976	1979	1985	1976	1979	1985
Newspapers[1]	741	865	1,110	392	476	450	49.5	52.8	50
Magazines[1]	1,170	1,609	2,490						
Books[1]	199	324	580	NA	825	800	7.5	7.4	7
Commercial printing[1]	908	1,262	1,970	NA	2,032	2,100	34.2	28.6	25
Manifold or continuous business forms printing[1]	311	528	960	NA	149	150	11.7	12.0	12
Printing for packaging[1]	271	384	610	NA	464	500	10.2	8.7	9
Service industries for the printing trade[1]	298	429	690	NA	388	400	12.4	12.4	13
Other printing[1]	92	122	180	NA	268	250	3.5	2.8	3
Total	3,990	5,523	8,590	NA	4,602	4,650	129.0	124.7	119
Firms with less than 10 employees	943	1,330	2,100	NA	10,000	10,000	30.0	30.0	30
Grand total	4,933	6,853	10,690	NA	14,602	14,650	159.0	154.7	149

[1] Includes only firms with 10 or more employees.

Source: See source notation of table 1.

which rose 17 percent in 1980, has stimulated the printing industry. Of the $3 billion spent on advertising in 1980, about 60 percent went to daily newspapers and magazines. In 1978, newspapers and magazines relied on advertising income for 40 percent of their revenues. Trade sources forecast regular increases in advertising expenditures, with even financially troubled industries such as textiles considering advertising as a decisive factor in the struggle for profit.

Most French publishers complain about labor costs and fringe benefits, which can reach 60 percent of total operating costs. Yet when compared to per hour costs in other Common Market countries, the labor charges of French craftsmen are about average. The industry has been slow to automate; traditional publishers have been reluctant to modernize and powerful unions have opposed any job-threatening changes. However, printers are finally investing in new equipment, and labor costs are expected to decline. Skilled, reliable craftsmen are in short supply, largely because training has not caught up with technology. In an industry in which machines are evolving rapidly after decades of no change, managers don't always realize the importance of retraining their present workers. Owners of small firms are particularly hesitant to release an employee for even a short training program because the loss of a single worker drastically disrupts production. Even young workers entering the industry often have outmoded skills, because schools do not have the financial capacity to buy up-to-date equipment.

In order to reduce overhead costs, printers are turning more to quality control and materials handling equipment. These devices increase in importance with each advance in technology of the printing equipment itself, ensuring the speed and performance for which the original investment was made.

Rising costs of paper and film are a major problem in the industry. French printers, who import most of their paper, have had to reduce the quality of the paper they use. In 1979, paper consumption declined in volume for the first time. Research aimed at reducing the use of photographic film in preprinting work has been spurred by rising film costs.

Legislatively, few, if any, changes are in store for French printers. The Socialist Government has not yet announced its economic views on the industry as a whole, and the new book price controls are not expected to affect the industry to any great degree. Likewise, no significant changes in pollution control regulation have occurred.

Newspaper printing.—The number of daily newspapers is expected to drop slightly from 155 in 1979 to 150 in 1985, but circulation should remain steady at around 12 milion copies (see table 5). Weekly papers, after a severe drop in numbers in the late 1970's, have stabilized at 650 publications, and a slight improvement in circulation to 5 million is foreseen. Newspaper printing plants, which employ about a third of the printing industry's workers, anticipate a slight drop in employment as the large and medium-sized firms that dominate the industry continue their push to automate. The 476 firms with 10 or more employees (see table 6) generated sales of $865 million in 1979 and expect to top the billion dollar mark in 1985.

Table 5.—France: Production of books, newspapers, and magazines, 1979 and 1985

	Number of titles		Circulation[1] (in millions)	
	1979	1985	1979	1985
Books				
Hardbound	10,359	12,000	106	120
Paperbound	16,328	19,300	275	340
Newspapers				
Daily	155	150	12	12
Weekly	650	650	4	5
Magazines				
Weekly	369	400	24	25
Monthly	4,523	4,500	68	80

[1] For books, number of copies is given.
Source: See source notation of table 1.

Capital expenditures are projected to grow an average 8.5 percent annually between 1979 and 1985 reaching $193 million, with $116 million devoted to purchases of graphic industries equipment (see table 7). With higher productivity as the objective, phototypesetting and offset printing methods are spreading rapidly for both local and national papers. In their continuous upgrading of equipment, newspaper publishers are installing VDT input devices, remote entry devices, processing systems, and web-fed presses.

Magazine printing.—Sales by French magazine publishers, growing an average 7.5 percent a year, are predicted to reach almost $2.5 billion in 1985. As leisure time increases, both circulation and the number of weekly and monthly magazines are expected to climb. New magazines devoted to sports and hobbies appear regularly, some of them with short lifetimes, but even the less successful ones are quickly replaced by more up-to-date publications.

Capital expenditures by magazine publishers are expected to rise over 8 percent yearly to $160 million in 1985. Purchases of graphic industries equipment, also increasing by 8 percent annually, are projected to reach $96 million. Publishers who are trying to capture particular markets with colorful, glossy magazines are turning to sophisticated photocomposition equipment, multicolor offset presses and scanners, as well as automated binding systems to speed up delivery schedules. The magazine printing sector, which uses gravure presses for about a third of its work, is the major user of such presses in the printing industry (see table 8).

Book printing.—Trade sources expect book sales to climb by about 10 percent a year to $580 million in 1985, but foresee the number of book publishing firms dropping slightly and the sector's labor force continuing its steady decline to 7,000 employees. Although book printing in general is not booming, several categories are popular in this book-conscious nation. Circulation of paperbacks, which represent about three-fourths of all literature books, is predicted to rise from 275 million copies in 1979 to 340 million copies in 1985; hobby books, which now account for 10 percent of sales, are in demand; and children's books, particularly comics, doubled in sales from 1974 to 1979.

Book publishers, who plan to devote $19 million to new equipment purchases in 1985, want machinery that speeds up production without sacrificing quality and that decreases their dependence on scarce and expensive skilled labor. In this line, strong demand is expected for fully computerized composition systems, sheet-fed multicolor offset presses, and completely automated book-printing systems. Because the sector is not very healthy financially, the price of the equipment will be the key criterion for many buyers.

Commercial printing.—With the boom in advertising, sales by commercial printers with 10 or more workers are expected to grow steadily at 7.7 percent annually between 1979 and 1985, reaching almost $2 billion. The sector employs nearly 29,000 people in 2,000 firms ranging in size from 10 workers to more than 100. Although the number of firms is expected to remain stable, employment is forecast to decline somewhat by 1985 as automation becomes more prevalent.

Table 6.—France: Number of firms by size[1] in the printing industry sector, 1979

	Number of firms[2] Large	Medium	Small	Total
Newspaper and magazine printing	285	112	79	476
Book printing	405	344	76	825
Commercial printing	542	1,042	448	2,032
Business forms printing	103	42	4	149
Printing for packaging	192	240	32	464
Service industries for the printing trade	21	226	141	388
Other printing	31	144	93	268

[1] Size of firms is based on number of employees as follows: large firms, over 100 employees; medium, 20 to 100; small 10 to 19.

[2] Includes only firms with 10 or more employees.

Source: See source notation of table 1.

Table 7.—France: Capital expenditures and purchases of graphic industries equipment by major user sectors, 1979 and 1985

(in millions of U.S. dollars)

	Capital expenditures 1979	1985	Purchases of graphic industries equipment 1979	1985
Newspaper printing	118.9	193	71.3	116
Magazine printing	100.1	161	60.0	96
Book printing	22.4	27	11.3	19
Commercial printing	56.2	87	45.0	77
Business form printing	25.3	41	18.8	39
Printing for packaging	18.3	36	15.0	32
Government printing	5.7	9	3.8	6
Service industries for the printing trade	21.6	33	18.8	32
In-plant printing	143.7	255	123.9	212
Other printing	11.2	18	7.5	13
Total	523.4	860	375.4	642

Source: See source notation of table 1.

Commercial printers, who produce all sorts of printed advertising, demand sophistication and good color in their work and will require input devices, multicolor sheet-fed presses, and finishing equipment such as collating and gathering machines and cutting and creasing machines. Equipment purchases are expected to escalate over 9 percent yearly to $77 million in 1985, out of a total $87 million budget for capital expenditures.

Business forms printing.—The business forms sector has two distinct areas, traditional business forms printing, which expects only limited growth, and continuous forms printing, which is growing steadily. Overall, the 150 firms with 10 or more employees anticipate sales rising by 10.5 percent annually to $960 million in 1985.

Printers of continuous forms, whose market is expanding with the proliferation of microcomputers, intend to increase their production with sophisticated new equipment. Capital expenditures are projected to reach nearly $41 milion in 1985, with equipment purchases burgeoning 13 percent yearly to close to $39 milion.

Printing for packaging.—Spurred by the explosion of prepackaged processed foods and the new demands for consumers for more detailed labeling, sales of package printing are predicted to increase sharply to $610 million in 1985. Buoyed by rising demand, the approximately 500 package printing firms are planning to more than double their purchases of graphic industries equipment, with special emphasis on flexographic and label-printing presses.

Government printing.—Observers believe the new

Government will continue previous French policy that stressed the importance of good public relations through a wealth of official printed matter. Capital expenditures are projected to reach $9 million in 1985, with $6 million allocated for purchases of sophisticated new equipment to improve both the quantity and quality of government materials. Public printers will look especially for better color printing equipment such as scanners and color presses.

Service industries for the printing trade.—With the increasing specialization of prepress and afterpress work has come the development of services such as photoengraving, phototypesetting and bookbinding that are dependent upon the printing industry's growth. The 388 firms in this sector with 10 or more employees plan to expand their equipment purchases by more than 9 percent yearly to $32 million in 1985. Because these firms often work under severe time pressure, they are likely to welcome any new and reliable equipment that helps them speed up their deliveries, including computerized editing/composition systems, tape-driven phototypesetting machines with a CRT, camera/processing systems, and color separation systems.

In-plant printing.—American vendors cannot afford to overlook the in-plant facilities that have been set up by about 30,000 companies to do in-house printing jobs. Trade unions have successfully restricted some types of in-plant printing but, since the practice offers considerable time savings to the parent company, it continues to grow steadily. French companies intend to increase their capital expenditures for in-plant printing by 10 percent yearly from $144 million in 1979 to $255 million in 1985.

The in-house facilities handle all the printing work for a company from routine traditional jobs to highly complex assignments. Thus, their equipment ranges from small offset machines to up-to-date phototypesetting equipment. A good share of the $212 million projected for 1985 equipment purchases will probably be spent on offset presses, typesetting equipment, and automated finishing equipment.

Additional Information

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Sales Desk Telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Graphic Industries Equipment—France," ITA 81-12-501, June 1981.

Table 8.—France: Type of printing process as percentage of total dollar volume of printing by end-user sector 1979 and 1985

	Letterpress		Offset Lithography		Gravure		Screen		
	1979	1985	1979	1985	1979	1985	1979	1985	Total
Newspaper printing	10	8	90	92	—	—	—	—	100
Magazine printing	25	20	68	73	3	3	4	4	100
Book printing	20	15	80	85	—	—	—	—	100
Commercial printing	3	2	63	65	34	33	—	—	100
Business forms printing	17	10	82	89	1	1	—	—	100
Printing for packaging	15	8	75	81	9	10	1	1	100
Government printing	22	17	77	82	1	1	—	—	100
In-plant printing	6	3	85	89	7	6	2	2	100
Other publishing and printing	15	15	80	80	3	3	2	2	100

Source: See source notation of table 1.

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427/83

International
Marketing Information
Series

BOOKSTACKS
DOCUMENTS

France

CMS/MED/427/83, December 1982

CMS

Country Market Survey

MEDICAL EQUIPMENT

France

DEPOSITORY
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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The French medical equipment market totaled $352 million[1] in 1980 and with an average 2.8 percent annual increase forecast, total sales are expected to reach $404 million in 1985 (see table 1). France's steady economic growth combined with a 13-percent increase in social security contributions helped maintain health budgets in the late 1970's and contributed to substantial equipment purchases. Tighter fiscal policies and increased demands for social service expenditures are expected to slow expansion of health care programs and lead to more careful buying of equipment over the next 5 years.

The greatest increase is anticipated in sales of disposables, which are projected to rise nearly 8 percent annually from $32 million in 1980 to more than $46 million in 1985 (see Most Salable Products list). Growth rates of around 4 percent per annum are forecast for sales of pulmonary apparatus ($17 million in 1985), clinical laboratory equipment ($17 million), and physical and occupational therapy equipment ($38 million). Sales of operating room equipment are expected to top $50 million in 1985, followed closely by general hospital equipment at $48 million.

New programs for France's 2 million handicapped are growing out of a humanization movement in French health care. Consequently, purchases of orthotic, prosthetic, and physical and occupational therapy equipment, sensory aids and adaptive systems, and architectural, transportation, and mobility equipment are forecast to climb from $88 million in 1980 to more than $100 million in 1985.

Table 1.—France: Estimated market for medical equipment by application areas, 1979-81 and projected 1985
(in millions of U.S. dollars)

Application Area	1979	1980	1981	1985
Cardiology equipment	14.9	15.8	16.6	18.7
Pulmonary apparatus	13.1	14.0	14.6	16.6
Neurological equipment	10.0	10.7	11.0	11.4
Ophthalmological equipment	24.3	26.1	26.7	27.9
Pediatric equipment	20.1	21.5	22.0	23.1
Renal equipment	4.9	5.0	5.0	5.4
Operating room equipment ...	47.1	48.4	46.9	51.2
General hospital equipment ...	42.9	46.0	46.8	47.5
Clinical laboratory equipment	13.1	14.0	14.6	16.6
Miscellaneous health care equipment	28.4	30.4	32.0	37.9
Disposables	30.0	31.8	31.2	46.2
Orthotic and prosthetic equipment	8.4	8.9	9.3	10.5
Architectural, transport, and mobility equipment	24.3	26.0	26.8	28.0
Physical and occupational therapy equipment	29.6	31.6	33.0	37.7
Sensory aids and adaptive systems	20.0	21.5	22.9	25.0
Total	331.1	351.7	359.4	403.7

Source: Ministry of Public Health and International Trade Administration, Market Research Division report, The Market for Medical Equipment—France (see Additional Information box).

Competitive Assessment

Imports of medical equipment are expected to rise from $326 million in 1980 to almost $365 million in 1985, growing an average 2.2 percent annually or slightly below the pace of the market. The Government's efforts to stimulate local production of equipment should improve the position of domestic manufacturers in some areas. However, imports are expected to continue providing more than half the market for cardiological, ophthalmological, and clinical laboratory equipment and at least 30 percent of disposables and pulmonary, pediatric, and renal equipment.

U.S. manufacturers have steadily increased their market share during the past decade and are now the leading foreign suppliers. The main third-country competition comes from Germany, the Netherlands, Sweden, the United Kingdom, and more recently, from Japan.

Domestic suppliers.—Output of the French medical equipment manufacturing industry totaled $284 million in 1979. The most important producer, Compagnie Generale de Radiologie (CGR), is known for its radiology, ultrasound, nuclear medicine, and radiotherapy products. Other important manufacturers and their products include Thomson-Medical Telco and Alvar Electronics (electromedical, neurological, and patient monitoring equipment), Pesty Technomed (respirators), Rhone Poulenc (renal dialysis equipment), Veller (operating room equipment), and Porges (disposables).

Among the major foreign subsidiaries manufacturing in France are Massiot Philips (Philips—Netherlands) which makes tomographs and cardiology equipment; Coultronic (cell counters) and Becton-Dickinson (disposables), American affiliates; and Kontron Electronics (Hoffman-La Roche—Switzerland) which produces cardiology and neurological equipment.

The local industry is made up of a large number of small manufacturers and relatively few large companies. Because of this small scale, French manufacturers have not competed effectively in the international market except in the area of CGR's X-ray and related equipment. The Government is trying to upgrade the industry and has specifically targeted it for growth during the Eighth Economic Plan (1980-85). Under the Plan the industry would be rationalized by consolidating manufacturers with a common technological base. However, manufacturers are resisting joining the Government's associations which imply centralized control from Paris. Analysts anticipate that the Government will subsidize certain sectors of the medical equipment industry and award research and development contracts in order to improve the industry's competitiveness and raise its technological level.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = F4.91 (1977), F4.51 (1978), F4.25 (1979), and F4.23 (1980 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollar.

Most Salable Products

Cardiology Equipment
- Cardiac output analyzers/computers
- Cardiotacometers
- Intracardiac catheters
- Telemetry systems for transmitting electrocardiograms
- Computer systems for ECG recordkeeping
- Computer programs (software) for ECG analyzers
- Computer systems for monitoring of automated laboratory instrumentation, on-line monitoring of cardiac outputs, etc.

Pulmonary Apparatus
- Equipment for diagnosing lung perfusion

Pediatric Equipment
- Cystic fibrosis analyzer

General Hospital Equipment
- Ultrasonic scanners
- Ultrasonic physiotherapy equipment
- Central station patient monitoring systems
- Bedside patient monitoring systems
- Electronic blood pressure indicators
- Whole body counters
- Computerized axial tomographic equipment

Clinical Laboratory Equipment
- Integrated systems for determining frequently specified routine analyses
- Automated blood cell counters
- Automated sample analyzers

Miscellaneous Health Care Equipment
- Mobile patient/population testing systems
- Mobile laboratory test systems
- X-ray units for mass chest surveys
- Mammographic equipment (X-ray and thermographic)
- Computers for multiphase screening centers

Disposables
- Prepared trays (especially for blood sampling and catheterization)

Orthotic/Prosthetic Equipment
- Prosthesis and components

Physical and Occupational Therapy Equipment
- Electrical stimulation equipment
- Whirlpools
- Hydrotherapy
- Diathermy
- Infrared, ultraviolet, and ultrasonic systems

Sensory Aids
- Writing/communication aids for partially sighted
- Training aids

Plans to assist the medical equipment industry are concentrated on several key areas. Efforts to develop new and technologically competitive cardiological devices such as programmable cardiac stimulators and solid state Holter devices will be directed by the Ministry of Industry (Directorate for the Electronics Industry and Informatics) and the National Agency for Application of Research. The Atomic Energy Commission is expected to aid research in nuclear medicine and ultrasound equipment.

Local producers already have broad competence and with only minor coordination are expected to enter the field of artificial organs, especially heart valves, completely transplantable hearts, and pancreas. Other planned product development includes heart lung machines, hemodialysis, and analgesia by electric stimulation of the nervous system. Knowledge derived from military applications will be transfered to the medical field for items such as thermographic cameras.

Domestic manufacturers are favored by an implied "buy French" policy. Lists of approved suppliers are maintained by the central authorities. The Ministry of Health must be consulted before expensive equipment can be purchased, and official advisors are connected to all major medical institutions. However, the buy national program cannot be explicit without violating European Economic Community (EEC) rules.

U.S. suppliers.—American manufacturers accounted for 22.5 percent of total medical equipment imports in 1980 (see tables 2 and 3) and are expected to increase their sales from $103 million in 1980 to $123 million by 1985. Although the U.S. share has been helped by the previous weakness of the dollar, it is performance and not price that leads French buyers to American medical equipment. The American commitment to training and pre- and post-sales service is especially appreciated.

U.S. firms do particularly well in high-technology areas, providing well over one third of the imported cardiological, pulmonary, neurological, and pediatric equipment. More than $10 million worth of physical and occupational therapy equipment was purchased in 1980 from U.S. companies, led by Howmet and Dow Corning. Technicon and Coulter are leading suppliers of clinical laboratory equipment. Bausch and Lomb helped create the $5 million market for U.S.-made ophthalmological equipment in 1980. Hewlett-Packard is well known for its cardiological, neurological, and general hospital equipment. Other U.S. manufacturers important in France include Medtronic (cardiology equipment), Air-Shields (pulmonary apparatus), Travenol (renal equipment), Nuclear Chicago (X-ray equipment), Coherent Radiation (ophthalmic equipment), and Sherwood, American Hospital

Table 2.—France: Imports of medical equipment by country of origin, 1977-80 and projected 1985

(in thousands of U.S. dollars)

	1977	1978	1979	1980	1985
Medical/surgical instruments including electromedical and ophthalmic (CCCN 9017)					
Total	131,731	184,515	234,065	250,875	300,000
From United States	33,602	49,802	61,040	63,485	75,000
Percent from United States	25.5%	26.9%	26.1%	25.3%	25%
Selected subcategories:					
Electrocardiographs (9017.010)					
United States	689	1,417	2,094	1,390	
Germany	1,113	1,595	1,426	1,667	
Japan	1,119	1,358	1,479	1,375	
Sweden	801	1,086	1,372	1,172	
Italy	410	577	769	927	
All other	862	1,322	1,811	2,047	
Total	4,994	7,355	8,951	8,578	
Electroencephalographs (9017.050)					
United States	—	101	415	221	
Netherlands	—	115	109	156	
United Kingdom	—	—	85	58	
Italy	—	—	51	35	
Germany	—	96	107	27	
All other	90	101	77	61	
Total	90	413	844	558	
Ultrasonic equipment for diagnosis (9017.051)					
United States	1,468	6,126	6,967	9,183	
Japan	714	2,171	4,363	9,191	
Austria	436	859	1,503	2,553	
Germany	802	1,493	1,770	1,486	
Australia	—	—	588	684	
All other	168	498	1,696	1,488	
Total	3,588	11,147	16,887	24,585	
Catheters and equipment for measuring blood characteristics and circulation (9017.052)					
United States	2,062	2,210	2,854	1,170	
Netherlands	—	84	311	99	
Germany	185	—	16	31	
Japan	—	68	67	16	
Belgium/ Luxembourg	147	—	78	11	
All other	307	364	90	300	
Total	2,701	2,726	3,416	1,627	
Scintillation equipment (9017.054)					
United States	563	310	270	255	
Italy	498	143	1	182	
Germany	87	—	11	13	
Denmark	214	547	609	5	
United Kingdom	—	112	37	—	
All other	185	153	21	491	
Total	1,547	1,265	949	946	
Other electrodiagnostic equipment (9017.056)					
United States	613	475	529	1,196	
Japan	240	262	538	1,126	
Germany	241	427	307	685	
Italy	161	232	416	398	
Denmark	221	306	327	265	
All other	190	449	1,071	673	
Total	1,666	2,151	3,188	4,343	
Renal dialysis equipment (9017.11)[1]					
United States	(1)	(1)	(1)	3,937	
Germany	—	—	—	9,513	
Netherlands	—	—	—	2,280	
Italy	—	—	—	1,034	
Japan	—	—	—	917	
All other	—	—	—	3,754	
Total	—	—	—	21,435	
Equipment for electrosurgery (9017.210)[2]					
United States	473	992	831	(2)	
Germany	215	263	150	—	
Italy	74	—	35	—	
Netherlands	—	—	24	—	
Japan	78	—	12	—	
All other	159	116	30	—	
Total	999	1,371	1,082	—	
Defibrillators and emergency apparatus (9017.212)[2]					
United States	—	—	82	(2)	
Israel	130	213	489	—	
Germany	152	168	201	—	
Netherlands	63	—	112	—	
All other	591	151	192	—	
Total	404	532	1,076	—	
Artificial kidneys, dialyzers (9017.213)[2]					
United States	3,382	4,751	3,533	(2)	
Germany	4,395	6,830	8,238	—	
Sweden	1,715	1,799	1,651	—	
Belgium/ Luxembourg	91	615	1,365	—	
Netherlands	634	1,484	1,163	—	
All other	3,069	2,417	3,747	—	
Total	13,286	17,896	19,697	—	
Other electrical medical equipment (9017.215)[2]					
United States	2,590	1,919	3,569	(2)	
Germany	1,441	2,293	3,089	—	
Netherlands	1,139	1,858	2,995	—	
United Kingdom	610	1,140	1,179	—	
Switzerland	273	194	417	—	
All other	1,279	1,534	1,479	—	
Total	7,332	8,938	12,728	—	
Transfusion apparatus (9017.23)[1]					
United States	(1)	(1)	(1)	321	
Belgium/ Luxembourg	—	—	—	1,572	

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[1] Classified under 9017.21 prior to 1980.

[2] Classified under different categories in 1980.

Table 2.—France: Imports of medical equipment by country of origin, 1977-80 and projected 1985 —Continued

(in thousands of U.S. dollars)

	1977	1978	1979	1980	1985
Germany	—	—	—	1,229	
All other	—	—	—	1,191	
Total	—	—	—	4,313	
Syringes - plastic (9017.25)[3]					
United States	(3)	(3)	(3)	1,667	
Ireland	—	—	—	12,022	
Germany	—	—	—	3,553	
Belgium/ Luxembourg	—	—	—	2,094	
Italy	—	—	—	1,291	
All other	—	—	—	3,905	
Total	—	—	—	24,532	
Syringes - other (9017.27)[3]					
United States	(3)	(3)	(3)	299	
Italy	—	—	—	776	
Netherlands	—	—	—	482	
All other	—	—	—	835	
Total	—	—	—	2,392	
Hypodermic needles (9017.32)[4]					
United States	(4)	(4)	(4)	1,375	
Ireland	—	—	—	6,105	
Belgium/ Luxembourg	—	—	—	4,598	
Japan	—	—	—	2,516	
All other	—	—	—	4,742	
Total	—	—	—	19,336	
Other needles (9017.34)[4]					
United States	(4)	(4)	(4)	5,305	
All other	—	—	—	1,931	
Total	—	—	—	7,236	
Anesthetic equipment (9017.400)					
United States	53	—	49	107	
United Kingdom	142	363	673	476	
Netherlands	—	—	27	49	
All other	47	208	82	154	
Total	242	571	831	786	
Special instruments for diagnosis except electrodiagnosis (9017.500)[5]					
United States	452	861	1,102	(5)	
Japan	3,252	5,085	6,721	—	
Germany	570	1,257	1,924	—	
Switzerland	—	847	969	—	
Poland	133	100	179	—	
All other	361	418	476	—	
Total	4,768	8,568	11,371	—	
Ophthalmic apparatus and instruments-nonoptical (9017.51)[4]					
United States	(4)	(4)	(4)	63	
Germany	—	—	—	255	
All other	—	—	—	560	
Total	—	—	—	878	
Ophthalmic apparatus and instruments-optical (9017.59)[4]					
United States	(4)	(4)	(4)	714	
Switzerland	—	—	—	868	
Germany	—	—	—	675	
All other	—	—	—	1,817	
Total	—	—	—	4,074	
Syringes (9017.700 .701)[6]					
United States	1,656	1,679	2,410	(6)	
Ireland	6,023	6,710	8,872	—	
Germany	1,488	2,540	3,219	—	
Italy	—	1,361	2,108	—	
Belgium/ Luxembourg	1,098	1,587	1,766	—	
All other	3,431	3,434	3,611	—	
Total	13,696	17,311	21,986	—	
Needles and other small surgical instruments (9017.900, .901, .903)[2]					
United States	632	2,038	2,364	(2)	
Ireland	3,587	4,680	6,307	—	
Belgium/ Luxembourg	1,847	3,999	4,299	—	
Japan	1,912	2,380	2,086	—	
United Kingdom	1,578	1,373	1,604	—	
All other	2,033	3,654	4,496	—	
Total	11,589	18,124	21,156	—	
Other equipment and instruments[2] (9017.902 in 1977, 9017.909 in 1978, 1979)					
United States	17,793	24,925	32,141	(2)	
Belgium/ Luxembourg	12,055	14,160	15,568	—	
Germany	10,081	10,802	12,996	—	
Ireland	1,599	5,589	9,693	—	
United Kingdom	5,600	7,029	8,897	—	
All other	12,582	16,711	22,343	—	
Total	59,710	79,216	101,638	—	
Ophthalmic apparatus and instruments-other (9017.99)[4]					
United States	(4)	(4)	(4)	36,058	
Germany	—	—	—	15,621	
Belgium/ Luxembourg	—	—	—	14,641	
United Kingdom	—	—	—	11,209	
Japan	—	—	—	10,302	
All other	—	—	—	32,998	
Total	—	—	—	120,829	
Mechanotherapy appliances, artificial respiration apparatus (CCCN 9018)					
Total	7,379	9,793	11,827	20,719	24,000
From United States	1,725	2,599	3,227	6,389	5,500
Percent from United States	23.3%	26.5%	27.3%	30.8%	23%

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[3] Classified under 9017.70 prior to 1980.

[4] Classified under 9017.21, .50, .90 prior to 1980.

[5] Classified under 9017.99 prior to 1980.

[6] Classified under 9017.25 and .27 in 1980.

Source: Official trade statistics.

Table 2.—France: Imports of medical equipment by country of origin, 1977-80 and projected 1985—Continued

(in thousands of U.S. dollars)

	1977	1978	1979	1980	1985
Selected subcategories:					
Electrical vibratory-massage apparatus (9018.110)					
United States	—	—	165	—	
Hong Kong	99	208	267	388	
Germany	98	109	151	327	
Italy	105	94	92	196	
Netherlands	75	—	32	—	
All other	27	53	149	—	
Total	404	464	856	911	
Other mechanotherapy or massage apparatus (9018.19)					
United States	131	253	287	272	
Germany	1,014	1,264	1,359	2,079	
Ireland	783	—	952	1,660	
Italy	219	190	216	380	
All other	310	1,340	565	679	
Total	2,457	3,047	3,379	5,070	
Respiration equipment for ozone, oxygen aerosol therapy (9018.300)					
United States	878	1,430	2,211	3,143	
Sweden	518	989	1,661	1,731	
Denmark	217	290	294	669	
United Kingdom	386	626	620	515	
Germany	112	290	243	208	
All other	264	488	737	721	
Total	2,375	4,113	5,766	6,987	
Other respiration apparatus (9018.501)					
United States	716	916	563	2,974	
Germany	—	—	67	1,689	
Sweden	1,210	755	641	1,194	
United Kingdom	123	136	83	953	
Denmark	—	269	293	117	
All other	45	71	136	824	
Total	2,094	2,147	1,783	7,751	
Prosthetic and orthopedic apparatus, hearing aids and implantable aids (CCCN 9019)					
Total	48,605	67,075	69,901	86,307	100,000
From United States	16,529	22,069	22,956	18,856	28,000
Percent from United States	34.0%	32.9%	32.8%	21.8%	28%
Selected subcategories:					
Apparatus for artificial limbs not specified elsewhere (9019.250)					
United States	3,375	5,124	5,419	8,269	
Switzerland	1,946	3,903	5,141	6,197	
Ireland	2,943	3,240	2,449	3,789	
United Kingdom	465	620	876	1,176	
Germany	479	578	749	929	
All other	180	438	418	516	
Total	9,388	13,903	15,052	20,876	
Hearing aids (9019.310)					
United States	98	104	143	200	
Denmark	2,333	2,795	3,357	4,335	
Germany	767	1,013	1,340	1,929	
Netherlands	1,663	1,423	1,642	1,743	
All other	1,055	1,504	1,791	2,506	
Total	5,916	6,839	8,273	10,713	
Cardiac stimulators (9019.510)					
United States	9,883	11,204	6,108	7,664	
Netherlands	8,158	14,784	8,874	7,700	
Australia	4,173	4,677	—	2,843	
Sweden	1,836	1,646	2,162	2,499	
All other	1,166	1,559	4,362	4,476	
Total	25,216	33,870	21,506	25,182	
Other hand-held, portable, or implanted apparatus (9019.550)					
United States	2,440	4,516	9,175	26	
Netherlands	134	152	5,399	5,678	
All other	307	650	1,899	13,005	
Total	2,881	5,318	16,473	18,709	
Orthopedic apparatus (9019.910)					
United States	679	681	634	2,022	
Germany	1,297	1,366	1,457	1,900	
All other	61	484	590	688	
Total	2,037	2,531	2,681	4,610	
Equipment for treating fractures (9019.950)					
United States	54	440	1,477	570	
Switzerland	2,360	3,065	3,302	3,919	
All other	402	639	491	666	
Total	2,816	4,144	5,270	5,155	
X-ray and other radiation equipment (CCCN 9020)					
Total	76,302	77,788	99,890	90,029	94,000
From United States	10,597	11,357	14,345	10,676	10,800
Percent from United States	13.9%	14.6%	14.4%	11.9%	11.5%
Selected subcategories:					
X-rays apparatus (9020.110)					
United States	6,776	5,934	8,149	3,648	
Belgium/ Luxembourg	13,186	13,382	18,687	17,050	
Germany	16,972	12,496	17,152	12,386	
Italy	4,644	3,580	4,987	7,748	
Netherlands	4,267	4,867	5,955	5,237	
All other	6,632	3,548	4,022	5,214	
Total	52,477	43,807	58,952	51,283	
X-ray tubes (9020.710)					
United States	802	1,033	820	1,408	
Germany	3,544	4,526	5,536	4,039	
Netherlands	504	650	682	662	
Switzerland	267	271	484	546	
United Kingdom	—	84	160	284	
All other	653	1,580	2,615	1,762	
Total	5,770	8,144	10,297	8,701	

Table 2.—France: Imports of medical equipment by country of origin, 1977-80 and projected 1985—Continued

(in thousands of U.S. dollars)

	1977	1978	1979	1980	1985
X-ray fluorescent screens, X-ray intensifying screens, antiscatter shields and grids (9020.750)					
United States	903	919	1,084	1,167	
Netherlands	462	391	522	471	
Germany	750	988	595	320	
Italy	—	123	214	203	
Sweden	137	196	178	56	
All other	110	98	151	90	
Total	2,362	2,715	2,744	2,307	

	1977	1978	1979	1980	1985
Other parts and accessories for X-ray equipment (9020.900)					
United States	1,800	2,694	3,415	3,331	
Germany	4,927	7,267	8,238	8,626	
Netherlands	2,542	3,220	4,514	6,283	
Belgium/ Luxembourg	1,521	2,080	2,258	1,878	
Italy	1,251	1,174	1,679	1,731	
All other	2,401	4,288	5,865	4,303	
Total	14,442	20,723	25,969	26,152	

Supply, and Becton Dickinson (disposables).

Third-country suppliers.—German firms supplied 18.2 percent of the medical equipment import market in 1979, down from 1975 when they led importers with 27 percent of the market. Siemens, a leading supplier of patient monitoring equipment, intensive care systems, general hospital, and operating room equipment, is renowned for product quality, reliability, and thoroughly efficient service and customer liaison. Draeger is regarded as a reliable supplier of incubators, anesthesia products, and respiratory equipment. Substantial quantities of ophthalmic equipment are purchased from Zeiss. The German company Hellige supplies cardiological products.

Belgium was the source of 11 percent of the medical equipment imported in 1979, followed closely by the Netherlands with 9 percent. Philips has successfully sold X-ray, cardiological, general hospital, and operating room equipment in France because of the high level of technology of its products. The company also has an excellent reputation for aftersales service and customer training. Vitatron and Gould Godart export clinical analyzers and general hospital equipment, respectively.

The United Kingdom's 4-percent share of the import market is due largely to Pye-Unicam (laboratory equipment), which uses the Philips group to support its products. The Swedish manufacturer LKB provides laboratory equipment, and Engstrom exports respirators and incubators to France.

The presence of Japanese companies in selected segments of the market is regarded as evidence of a concentrated effort to develop European markets for their medical equipment. Japanese-made products, most notably ophthalmics and ultrasonic and other diagnostic equipment, accounted for 5 percent of imports in 1979.

Health Care System

France has one of the most highly developed health care systems in Europe. National expenditures on all aspects of medical care grew from $10.5 billion in 1970 to $28 billion in 1977. Expenditures on health care and social services (including support payments for the sick and other health-related maintenance benefits) have been growing steadily, reaching 25.4 percent of the Gross National Product in 1978. The system is well staffed with doctors, and health insurance coverage is nearly universal. French citizens have the statutory right to a medical examination every 5 years.

Although a large portion of France's health care system is expected to remain in private control, government involvement is expected to increase under the Eighth Plan. The goal is to modernize and raise the technological level of health care without expanding the already adequate number of hospital beds. The Government hopes to accomplish these changes by guiding rather than directing.

Under the previous Seventh Health Care Plan, hospitals were reorganized into smaller units to "humanize" the system. The Eighth Plan will continue this theme of taking the hospital to the people by placing additional attention on preventive medicine and urban diseases. Problems singled out and targeted for specific government action in the coming years include circulatory diseases, cancers, mental disorders, alcoholism, accidents, and handicaps in children. Antialcohol and anticancer centers are being strengthened. The development of epidemiology services will be greatly encouraged.

Over 98 percent of the French population is covered under the health insurance program. Health insurance covers 100 percent of major surgery, intensive care, and prolonged hospitalization; 90 percent of prescribed medicine; 80 percent of medical, surgical, and laboratory fees; and 70 percent of medical consultation fees. Private health insurance plans cover a large percentage of medical expenses not reimbursed under the national plan. Generally, patients pay 20 percent of their total medical expenses, however.

Table 3.—France: Estimated imports of medical equipment by application areas, 1979, 1980, and projected 1985

(in millions of U.S. dollars)

	1979		1980		1985	
	Total	From U.S.	Total	From U.S.	Total	From U.S.
Cardiological equipment	14.6	5.1	15.8	5.7	17.5	6.2
Pulmonary apparatus	10.3	3.6	10.6	3.6	11.8	4.1
Neurological equipment	13.8	4.8	14.2	4.9	15.5	5.3
Ophthalmological equipment	21.6	4.8	23.0	5.0	25.1	5.5
Pediatric equipment	19.2	7.2	20.4	7.3	22.5	7.8
Renal equipment	33.1	6.8	33.5	7.1	37.5	8.0
Operating room equipment	43.0	7.0	46.5	7.3	51.7	7.8
General hospital equipment	44.9	6.5	47.8	7.2	53.3	7.5
Clinical laboratory equipment	13.8	4.2	14.7	4.3	17.0	4.8
Miscellaneous health care equipment	25.8	7.8	28.5	8.2	32.1	9.0
Disposables	8.6	.8	9.1	1.0	10.0	1.0
Orthotic and prosthetic equipment	9.0	2.4	9.6	2.5	10.0	2.6
Architectural, transportation, and mobility equipment	12.9	2.3	13.7	2.6	15.4	3.0
Physical and occupational therapy equipment	25.7	10.0	27.4	10.4	31.1	10.7
Sensory aids and adaptive systems	10.3	.5	11.0	.5	12.5	.5
Total	306.6	73.8	325.8	77.6	363.0	83.8

Source: See source notation of table 1.

France has one doctor per 375 inhabitants. This ratio is very high compared to most other industrial nations where the rate is 1 per 600. There were approximately 100,000 doctors in 1979, a number projected to rise as high as 140,000 under the Eighth Plan. Many of the new doctors are going into general practice rather than specializing, and the trend is toward group practice. The abundance of doctors has led many students into industry and journalism rather than direct practice.

Although France is well supplied with doctors, there is an acute shortage of nurses, qualified technicians, and auxiliary hospital staff. These shortages have a contradictory effect on the demand for medical equipment. The shortage of nurses leads to increased demand for sophisticated monitoring and surveillance systems. The lack of trained technicians, however, makes medical administrators reluctant to invest in sophisticated equipment. The Eighth Plan calls for increasing the number and quality of technicians, but the shortage of nurses is forecast to continue for some time.

The ratio of 13.44 hospital beds per 1,000 population is higher than anywhere else in Europe except the Scandinavian countries. In 1977 France had 1,048 public hospitals (of which 119 were mental hospitals and 40 were antituberculosis) and 2,494 private hospitals (of which 772 were nonprofit). Most of the private hospitals are considerably smaller than the public hospitals, many having less than 60 beds. Among public and private hospitals combined, 1,564 were classified as serving general and specialized medicine, 1,723 specialized in surgery, 1,229 in maternity, 707 were for convalescence, and 214 for rehabilitation. General hospitals spent $153 million on medical equipment, supplies, and furniture in 1980, accounting for 40 percent of total expenditures (see table 4).

Table 4.—France: Expenditures for medical equipment, supplies, and furniture by major users sectors, 1980 and projected 1985

(in millions of U.S. dollars)

	1980		1985	
	Equipment/supplies	Furniture	Equipment/supplies	Furniture
General hospitals	123	30	165	30
University medical centers	82	20	110	22
Specialized medical institutions, e.g., cancer clinics	34	8	50	10
Military hospitals	2	.5	2.5	.5
Clinical laboratories	24	6	35	7
Mobile and permanent health care/population screening centers	25	5	36	7
Physicians (private practitioners)	18	3	27	4
Total	308	72.5	425.5	80.5

Source: See source notation of table 1.

Table 5.—France: The distribution of beds and hospitals between the public and private sector, 1967, 1972, 1976, and 1977

	1967	1972	1976	1977
Public hospitals	1,098	1,080	1,048	1,048
of which mental hospitals	100	110	118	119
of which anti tuberculosis.......	103	64	40	40
Private hospitals.......	2,799	2,721	2,508	2,494
Nonprofit establishments		857	765	772
Total hospitals	3,897	3,801	3,556	3,542
Beds - public..........	325,662	383,412	382,270	390,354
of which mental hospitals	94,000	103,064	106,639	106,809
of which anti-tuberculosis.......	16,884	10,878	8,000	8,000
Beds - private	161,630	153,847	175,261	178,067
Total beds	487,292	537,259	557,531	568,421

Source: Ministry of Public Health.

Table 6.—France: Doctors in private specialist practice classified by specialization, 1978

Discipline	Number	Index[1]
Anesthetics	1,728	3.2
Cardiology	1,712	3.2
Surgery	2,858	5.4
Skin diseases.............................	1,151	2.2
Electroradiology.............................	2,482	4.8
Gynecology.............................	2,119	4.0
Digestive disorders.............................	879	1.7
Internal medicine	484	.9
Neurosurgery	33	.1
Neuropsychiatry.............................	1,460	2.7
Ophthalmics.............................	2,339	4.4
Ear, nose, and throat.............................	1,683	3.1
Pediatrics	1,969	3.7
Pulmonary	577	1.1
Psychiatry.............................	1,033	1.9
Rehabilitation	274	.5
Rheumatology	1,006	1.9
Stomatology.............................	1,088	2.0
Subtotal	24,875	46.6
Other.............................	822	1.6
Total	25,697	48.2

[1] Index is number per 100,000 of population. Source: Ministry of Public Health.

Of the 568,421 hospital beds in 1977, 390,354 were in public institutions and 178,067 were private. There are excess beds in general medicine, surgery, and gynecology-obstetrics and a shortage of geriatric clinics.

Marketing Practices

Except for surgical instruments and other items of small value and less sophistication like disposables, the majority of medical equipment in France is sold directly to hospitals and clinics rather than through agents/distributors. About 95 percent of operating room, X-ray, and radiological equipment are sold directly. In the public sector, there are three main buying procedures. Individual specialists send their requests to the central buying authority, the Union de Groupements D'Achats Publiques (UGAP), which accounts for over half the total amount purchased in the public sector. Direct purchases can also be made, although this is less frequent and usually for smaller and expendable equipment. The Assistance Publique de Paris is another major purchasing authority.

The Ministry of Health approves hospital allocations annually, but the budget is administered within the individual hospitals. The French Government

Table 7.—France: National health care expenditures by type, 1970, 1976, and 1977

(in millions of U.S. dollars)

	1970	1976	1977
Medical expenditure	9,734	22,717	25,950
Other medical items.............	350	758	893
Total medical expenditure ...	10,084	23,475	26,843
Teaching......................	104	318	335
Medical research	129	317	362
Other.........................	37	98	112
General administration	130	245	251
Total national expenditure ...	10,484	24,453	27,903

Source: Ministry of Public Health and CREDOC.

Table 8.—France: National expenditures on health care classified by application, 1970, 1976, and 1977

(In millions of U.S. dollars)

	1970	1976	1977
Hospitalization (public)..........	2,624	7,752	9,213
Hospitalization (private)	1,356	3,426	4,021
Transport of patients............	68	178	218
Total - hospitalizations	4,048	11,356	13,452
Physician services...............	1,719	3,763	4,144
Auxilliary services	316	790	960
Laboratory services	239	658	720
Dental care....................	1,032	2,157	2,581
Cures.........................	69	151	167
Total - ambulatory services...	3,375	7,519	8,572
Pharmacy	2,840	5,049	5,313
Optician-orthopedics supplies.....	202	433	477
Total-medicaments supplies	3,042	5,482	5,790
Not attributed	19	96	89
Total......................	10,484	24,453	27,903

Source: See source notation of table 1.

denies any "buy French" policy, but, in fact, local manufacturers are favored by the way purchasing decisions are made. Under Directive No. 75-883, the Ministry of Health must be consulted before certain equipment is bought. For equipment that does not appear on the Directive, department heads (the leading surgeons) decide what to buy. When major pieces of equipment are involved, the recommendation of the surgeon may be referred to an advisory committee within the hospital. This committee evaluates competing demands and ensures that requests are consistent with the budget allocation.

For equipment listed on Directive 75-881, the hospital can only recommend purchase; the decision is made by a technical committee of the Ministry of Health, which links into the French Standards Institute, the Ministry of Industry, and ANVAR. This committee attempts to find reasons why the equipment should not be purchased and to determine if a French manufacturer could possibly produce the equipment, now or in the future. French hospitals had to wait to acquire whole body scanners until CGR was able to supply them.

UGAP influences the purchase of medical equipment more than any other group in France. Although the individual surgeon exerts considerable pull, manufacturers often need to appear on the UGAP list of preferred suppliers. At the local level, purchasing decisions can be swayed by a local supplier's need to maintain production and, in turn, employment levels.

Trade Regulations

Tariffs provide only very limited protection from import competition. No tariffs at all are levied against products from other EEC countries. Duties on imported goods from non-EEC countries range from 5 percent to 20 percent and change frequently. French buyers, however, are generally more concerned with performance and service than price. Customs stamp duty is normally charged at 2 percent of the total import duty. In addition to import duties, a value added tax is levied on all products including those originating within France itself.

Although import licenses are generally not required for biomedical equipment, technical visas are demanded for anesthetic equipment, syringes, surgical needles, and for certain specialist diagnostic equipment. The importer must apply to the Ministere de l'Industrie et Recherche for such visas and should support his application with a detailed pro forma invoice in French.

Technical Standards

The Union Technique de l'Electricite issues official standards for medical, radiological, and electronic equipment. The Association Francaise de Normalisation (AFNOR) handles applications for approvals. Generally, approval is required for each type or series of equipment, and each year AFNOR publishes a list of approved devices. The local agent or office should contact AFNOR to determine what information should accompany the application. Its address is:

CEDEX 7 Tour Europe
92080 Paris - La Defense
France

AFNOR will refer the agent to special committees or other bodies to which application will have to be made and will indicate the methods of test to be adopted. Approval takes approximately 12 weeks.

France enforces EEC directives for electrical equipment. In addition, all electrical medical health equipment issued in France must pass safety tests administered by AFNOR. U.S. standards are generally acceptable.

Table 9.—France: Expenditure on health care and social services as a proportion of GDP, 1970 and 1974-78[1]

(in millions of U.S. dollars except as indicated)

	1970	1974	1975	1976	1977	1978
Actual expenditure	34,779	57,409	81,135	81,446	96,545	119,793
Expenditure at 1975 prices	56,258	72,974	81,135	86,506	92,336	96,248
Gross domestic product	171,996	265,759	338,536	334,474	381,910	471,876
Health and social services expenditures as percent of GDP	20.2	21.6	24.0	24.4	25.3	25.4
Per capita expenditures (dollars)	1,045	1,240	1,539	1,403	1,520	1,718

[1] These expenditures include nonmedical expenditures, such as support payments for the ill and incapacitated and maternity benefits.

Source: See source notation of table 1.

Additional Information

This Survey is one of a series based on market research reports prepared overseas for the International Trade Administration. Other detailed marketing information on France is available from:

Country Specialist—France
International Trade Administration
U.S. Department of Commerce
Washington, D.C. 20230

A copy of the original research which this Country Market Survey summarizes can be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650
Rush Order telephone: (800) 336-4700

This 199-page report includes detailed information on the French medical equipment market together with names and addresses of end users, distributors, professional associations, and publications. When ordering report, please request: "The Market for Medical Equipment—France," ITA 81-09-504.

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France

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CMS

Country Market Survey

Sporting Goods and Recreational Equipment

France

DEPOSITORY
APR 6 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Sales of sporting goods and recreational equipment in France are expected to reach $1.3 billion[1] in 1985, rising at an average annual rate of 5.7 percent from their 1981 level of $1 billion (see table 1). Retail sales account for more than 90 percent of sales. Overall, the market is forecast to be strongest after 1983, when an improving French economy is expected to revitalize the market, boasting sales an average 6.5 percent annually. This contrasts to the 1981-3 period, when economic difficulties and market instability are expected to lead to growth rates of less than 3 percent annually.

Segments of the market expected to register the best performances during the survey period include gymnasium, gymnastic, and exercise equipment (10.2 percent average annual growth), equipment for racket sports (9.6 percent), golf equipment (8 percent), and bicycles (7.7 percent). Conversely, the skiing equipment and fishing equipment markets, both of which are comparatively large, are experiencing difficulties and are predicted to grow at rates of only 4.3 percent.

Imports totaled $322 million in 1980 (see table 2) and are expected to account for a similar portion of the market through 1985. U.S. firms, with French sales forecast to exceed $15 million in 1985, are expected to retain their 4-percent share of imports.

The market for sporting goods and recreational equipment in France is currently in a state of flux, with some of the most notable changes occurring in retail distribution. The former monopoly enjoyed by specialist sports shops has been largely overtaken by department stores and other organizations with big selling areas and bulk-buying capabilities. With all retailers trimming profit margins and seeking new ways to reduce costs, the trend is to deal directly with manufacturers instead of middlemen such as importers or wholesalers.

These changes have occurred against a backdrop of general economic difficulties, a climate shared with France's EEC trading partners and, indeed, the world. The market has also been affected by oversupply and low-cost imports from areas such as Korea and Taiwan.

Demographics also play an important role in understanding the French market. With a population of some 53 million people, the country is approximately a quarter the size of the United States and the fourth-largest European nation behind Germany, the United Kingdom, and Italy. Still, despite efforts at decentralization, Paris remains the overwhelmingly dominant city with more than 20 percent of the population. The surface area is twice that of any

Table 1.—France: Sales of sporting goods and recreational equipment, 1980-81, 1983, and 1985

(in millions of U.S. dollars)

	1980	Estimated 1981	Forecast 1983	Forecast 1985
Equipment for racket sports				
Retail sales	65.3	71.7	88.2	106.8
Wholesaler/manufacturer sales to institutions/businesses	4.3	4.7	2.7	3.3
Total	69.6	76.4	90.9	110.1
Golf equipment				
Retail sales	6.1	5.2	5.8	7.0
Wholesaler/manufacturer sales to institutions/businesses	.8	.7	.8	1.0
Total	6.9	5.9	6.6	9.0
Fishing equipment				
Retail sales	54.4	54.9	58.8	64.9
Wholesaler/manufacturer sales to institutions/businesses	5.7	5.7	6.1	6.7
Total	60.1	60.6	64.9	71.6
Skiing equipment				
Retail sales	46.1	47.3	51.0	58.8
Wholesaler/manufacturer sales to institutions/businesses	10.3	10.5	11.4	9.8
Total	56.4	57.8	62.4	68.6
Bicycles				
Retail sales	290.4	277.2	308.5	373.2
Wholesaler/manufacturer sales to institutions/businesses	6.9	6.6	7.3	8.9
Total	297.3	283.8	315.8	382.1
Gymnasium, gymnastic, and exercise equipment				
Retail sales	11.7	14.1	18.6	20.8
Wholesaler/manufacturer sales to institutions/businesses	17.2	20.5	27.0	30.3
Total	28.9	34.6	45.6	51.1
Inflatable balls				
Retail sales	30.4	28.8	29.7	32.2
Wholesaler/manufacturer sales to institutions/businesses	3.0	2.8	2.9	3.1
Total	33.4	31.6	32.6	35.3
Billiard and pool equipment				
Retail sales	.2	.2	.2	.2
Wholesaler/manufacturer sales to institutions/businesses	1.5	1.5	1.6	1.7
Total	1.7	1.7	1.8	1.9
Skates (ice and roller)				
Retail sales	2.0	1.7	1.5	1.4
Wholesaler/manufacturer sales to institutions/businesses	.3	.3	.2	.2
Total	2.3	2.0	1.7	1.6

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1=4.23 francs (1980) and 5.44 francs (1981 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

Table 1.—France: Sales of sporting goods and recreational equipment, 1980-81, 1983, and 1985—Continued

	1980	Estimated 1981	Forecast 1983	Forecast 1985
Baseball and softball equipment				
Retail sales	–	—	–	–
Wholesaler/manufacturer sales to institutions/ businesses	.3	.3	.4	.4
Total	.3	.3	.4	.4
Archery equipment				
Retail sales	1.1	1.4	1.6	1.8
Wholesaler/manufacturer sales to institutions/ businesses	.6	.7	.9	1.0
Total	1.7	2.1	2.5	2.8
Marine engines				
Retail sales	36.6	34.5	37.2	42.3
Wholesaler/manufacturer sales to institutions/ businesses	6.1	5.7	6.2	7.0
Total	42.7	40.2	43.4	49.3
Travel trailers				
Retail sales	476.4	413.7	443.1	479.3
Wholesaler/manufacturer sales to institutions/ businesses	16.7	14.5	15.6	16.8
Total	493.1	428.2	458.7	496.1

Source: French Customs Statistics for Import and Export, FIFAS Production Statistics, and International Trade Administration, Office of Trade Information Services research report, The Market for Sporting Goods and Recreational Equipment France (see Additional Information box).

other Western European nation, requiring a retail distribution network with a relatively low per capita count per outlet. For example, France has approximaterly 4, 500 sporting goods specialty shops, as opposed to only 2,200 in Germany. Thus, each French shop serves on average 11,844 people, compared to 27,864 for a German store.

Competitive Environment

The domestic sporting goods industry in France is well developed and organized, comprising 108 manufacturing firms and employing 9,693 people in 1980. Their major strengths are in bicycles, ski boots, skis, fishing equipment, and caravans/motor homes. Many firms are world leaders in their respective fields, notably Rossignol (skis), Look and Salomon (ski bindings), Kerma (ski poles), and Babolat, Maillot, Witt (gut strings). Peugeot (bicycles) enjoys a very good international reputation as well.

Conversely, certain segments of the market have only one French supplier of note—for example, Gauthier and Trappeur are the sole makers of tennis gear and ski boots, respectively. Foreign sources provide most of the tennis and squash equipment, inflatable balls, ice and roller skates, and billiard, pool, and gymnastic equipment. Virtually all golf balls, golf clubs, baseball and softball gear, archery equipment, and marine engines are imported.

Traditionally, products from U.S. suppliers have done well in the French market, particularly where technology and product innovation are important. However, because of freight rates, customs duties, and the dollar/franc relationship, products from the United States tend to be more expensive than locally produced or Far Eastern goods and are thus most competitive at the upper end of the market. In some cases American firms serve the French market from production facilities outside the United States, and their continued success in the market is partly keyed to this factor. Market segments where U.S. manufacturers are expected to continue to do well include tennis, outboard engines, and golf equipment, although competition is increasing from the Far East in the first two areas. The outlook in skiing is less bright, although cross-country equipment should perform better than alpine. The future is also good for tennis balls, bi-cross bicycles, archery equipment, and golf balls.

Within the Common Market, which encourages trade among members, the most important competition in the sporting goods area comes from Italian firms, followed by U.K. and German companies. Suppliers from other European countries, notably Austria and Spain, have also made inroads in the French market. Taiwanese, Korean, and Pakistani manufacturers succeed with high-quality goods at attractive prices, often shipped duty-free because of trade concessions to developing countries. Japanese vendors are major suppliers of fishing and boating equipment and are serious contenders for sales of products that involve high technology.

Product Market Profiles

Equipment for racket sports.—Sales of equipment for racket sports such as tennis, squash, and badminton are forecast to total $110 million in 1985. Tennis is by far the largest racket sport in France, with 2.4 million players in 1980, representing 98.8 percent of all competitors in racket sports. Approximately one-third of these players were licensed. Licensed players must belong to a club and generally play more often than unlicensed participants.

The market for tennis rackets, which had been growing at approximately 13 to 15 percent per annum, is expected to increase during 1982-83 at a slightly slower rate of perhaps 10 percent annually until the end of 1983 when economic conditions are forecast to improve. At that time, the unfilled demand for more courts can be addressed, and market growth should approach the rapid expansion rates of previous

Table 2.—France: Imports of sporting goods and recreational equipment, 1978-80

(in thousands of U.S. dollars)

	1978	1979	1980
Tennis rackets			
United States	1,252	1,342	2,085
Taiwan	2,006	4,029	8,176
Benelux	2,495	3,243	5,542
Austria	1,336	2,477	3,574
All others	2,480	3,775	4,179
Total	9,569	14,866	23,556
Tennis balls			
United States	–	–	100
Ireland	1,325	2,229	3,673
United Kingdom	947	1,945	3,499
Taiwan	–	–	190
All others	449	479	792
Total	2,721	4,653	8,254
Gut strings			
United States	339	336	676
Brazil	1,640	1,632	2,608
Italy	1,126	1,344	2,061
Morocco	1,650	1,833	1,439
All others	264	403	752
Total	5,019	5,548	7,536
Badminton and similar rackets			
United States	–	–	–
Taiwan	1,176	1,639	1,574
Italy	–	–	396
Germany	–	–	374
United Kingdom	–	–	71
All others	169	270	168
Total	1,345	1,909	2,583
Fishing hooks			
United States	–	–	–
Norway	947	1,039	1,399
Singapore	–	–	86
All others	87	153	217
Total	1,034	1,192	1,702
Fishing reels, plastic			
United States	–	–	–
France	97	1,649	174
Japan	–	–	92
All others	56	156	72
Total	153	1,805	338
Fishing reels, nonplastic			
United States	160	202	247
Japan	2,166	1,823	2,371
South Korea	599	910	820
All others	397	612	578
Total	3,322	3,547	4,016
Fishing rods			
United States	179	94	134
South Korea	1,703	3,454	5,550
Spain	2,415	2,443	1,294
Japan	1,289	944	880
All others	863	1,371	2,428
Total	6,449	8,306	10,286
Fising nets and accessories			
United States	125	181	183
Tunisia	332	585	754
Fishing nets and accessories—Con.			
Japan	398	470	577
Italy	311	386	561
All others	1,277	1,807	1,855
Total	2,443	3,429	3,930
Golf clubs, hockey sticks and pelotta equipment			
United States	424	486	778
United Kingdom	349	491	678
Canada	–	–	80
All others	231	410	321
Total	1,004	1,387	1,857
Golf, pelotta, and baseball balls			
United States	83	163	249
United Kingdom	321	1,336	1,725
Germany	–	271	539
All others	280	541	537
Total	684	2,311	3,050
Skis			
United States	1,185	866	1,600
Austria	6,822	6,949	8,116
Italy	1,912	3,240	2,105
All others	2,099	3,212	5,320
Total	12,018	14,267	17,141
Ski bindings			
United States	–	98	–
Austria	728	1,453	1,383
Germany	723	913	930
Norway	326	283	334
All others	824	1,361	1,219
Total	2,601	4,108	3,866
Bicycles			
United States	–	–	311
Italy	15,014	22,398	28,862
Spain	637	1,418	3,476
United Kingdom	1,903	1,473	3,242
All others	1,754	3,225	5,255
Total	19,308	28,514	41,146
Athletic and gymnastic sports equipment			
United States	211	680	243
Germany	778	1,343	1,325
Italy	308	824	1,039
Spain	81	226	584
Taiwan	68	–	286
All others	483	160	239
Total	1,929	3,233	3,716
Inflatable balls			
United States	80	–	–
Pakistan	4,539	5,414	5,086
Spain	1,338	1,842	1,331
Hungary	945	907	1,236
All others	4,636	5,643	5,127
Total	11,538	13,806	12,780

Table 2.—France: Imports of sporting goods and recreational equipment, 1978-80—Continued

	1978	1979	1980
Pool and billard equipment			
United States	–	–	–
Italy	–	83	–
All others	98	150	–
Total	98	233	–
Ice and roller skates			
United States	1,039	–	95
Canada	226	280	477
Taiwan	1,883	254	452
United Kingdom	1,139	265	362
All others	1,459	297	479
Total	5,746	1,096	1,865
Travel trailers			
United States	–	–	–
Germany	25,675	40,277	48,782
United Kingdom	18,913	29,290	35,707
Yugoslavia	27,543	29,832	27,281
All others	17,966	21,710	21,043
Total	90,097	121,109	132,813

	1978	1979	1980
Outboard engines			
United States	NA	NA	2,479
Japan	NA	NA	9,658
Benelux	NA	NA	9,572
Sweden	NA	NA	925
All others	NA	NA	1,392
Total	NA	NA	24,026
Inboard engines, petrol			
United States	NA	NA	1,711
United Kingdom	NA	NA	3
Japan	NA	NA	20
All others	NA	NA	1,664
Total	NA	NA	3,398
Inboard engines, diesel			
United States	NA	NA	1,908
United Kingdom	NA	NA	4,765
Japan	NA	NA	2,881
All others	NA	NA	4,375
Total	NA	NA	13,929

Source: International Trade Administration, Office of Trade Information Services research study.

years. Approximately 1.6 million tennis rackets were sold in 1980, three-fourths through recognized sporting goods channels and the remainder through supermarkets, resort shops, and discount houses. Wood rackets predominated with 78 percent of the market, followed by wood and fiber combinations (10 percent), fiber (6 percent), metal and plastic combinations (3 percent), and metal (3 percent). About 56 percent of all rackets were purchased for men, 32 percent for children under 15, and 12 percent for women. For every unstrung racket, there were nine strung ones at point of sale, with the unstrung rackets almost exclusively in higher price ranges.

Approximately 94 percent of all tennis rackets sold in 1980 were imported; the major source was Taiwan, followed by the Benelux countries, Austria, and the United States. The remaining 6 percent was produced by the sole domestic supplier, Gauthier. Major suppliers, among a universe of more than 35, include market leader Donnay (38 percent of the market), Adidas (17 percent), Dunlop (United Kingdom, 17 percent), and Snauwaert (9 percent). The outlook for American suppliers is extremely favorable, especially for quality goods, as long as dollar stability can be maintained. Among the more successful U.S. firms are Head, Bancroft, Victor Davis, Prince, Wilson, and Spalding. Competition is likely to be increasingly keen, however, in price-sensitive segments where Taiwanese suppliers have been gaining strength.

The market for tennis balls was estimated at 1.5 million dozen in 1980. The major supplier is Dunlop with a 53 percent market share, followed by Penn (United States), 27 percent; Slazenger (United Kingdom), 12 percent; and Trethorn (United States), 7 percent. With the exception of some Dunlop products which are made in central France, all balls are imported. The market was previously dominated by Dunlop and Slazenger, but Penn has garnered a major position operating from a duty-free base in Northern Ireland; its distributor in France is Donnay. Dunlop and Slazenger operate their own distribution systems, and Trethorn is marketed by Montana, a leading French wholesaler. Ninety percent of all balls are sold in boxes and 10 percent in tubes, a totally different picture from U.S. sales.

Imports of gut strings amounted to $7.5 million in 1980, an increase of almost 36 percent over the previous year. U.S. firms captured 9 percent of the market, trailing vendors from Brazil, Italy, and Morocco. The world's largest gut producer is France's Babolat, Maillot, Witt, and a significant portion of imports is processed for ultimate reexport.

Squash is a relatively new game in France. In 1980, the 25,000 players (10,000 licensed) represented just 1 percent of all participants in racket sports. The sport has been developing quickly in other parts of West Europe, but in France the enclosed nature of the court, a dearth of suitable facilities, and a traditional French disinterest in highly energetic sports have combined to impede development. Still, the Federation Francaise de Squash-Raquettes, founded in December 1980, is aiming to double the number of players by 1985. At present there are some 160 clubs with about 400 courts. The market for squash rackets is about 25-30,000 units annually with the principal brands being of U.K. origin, but, are of Far East manufacture. The most important include Adidas, Donnay, Slazenger, Goudie, Dunlop, Grays, Ascot, La Coste, and Unsquashable. Considering the extremely rapid growth of squash in the United Kingdom, Germany, and Sweden, forecasts of an 18-20 percent annual increase in the years ahead do not seem unreasonable.

Badminton is the least important racket sport in France, involving only 5,000 players (4,000 licensed) in 1980. There are some 100 venues for badminton throughout the country. The Federation Francaise de Badminton, founded in 1978, suggests the sport is growing at about 25 percent each year, but expansion is limited by a lack of facilities and few trainers and coaches. The market for "competitive" badminton rackets is estimated at 2,000 units annually, and opportunities for U.S. suppliers appear rather limited. Most suppliers are from the United Kingdom, Japan, and Taiwan. Direct sales to clubs are an important feature of this market. A vast number of inexpensive "fun" rackets are also sold outside of sporting goods channels for vacation or backyard use.

Golf equipment.—Sales of golf equipment are expected to total $9 million in 1985. The number of licensed golfers has been growing by 16 percent per year recently. Some 50,500 players were licensed in 1980, including 38,750 (76.7 percent) with annual licenses and 11,750 with temporary cards; 138 courses were in use, of which 17 were open to the general public (16 more public courses are scheduled to open soon). The Federation Francaise de Golf aims to have 100,000 licensed members by 1990.

The market for golf clubs and irons was estimated at 20,000 units in 1980. Approximately 9,000 golf bags, 9,000 golf carts, and 400,000 golf balls were also sold. All equipment is imported, and U.S. makers have traditionally done well in this market. Leading suppliers include Dunlop, Slazenger, and Wilson and Ben Hogan (United States). About 80 percent of all sales are made through pro shops, with the remainder through highly specialized retailers such as Tunmer in Paris. However, these sales are estimated to account for only about 70 percent of all golf equipment used in France; many golfers purchase their equipment abroad where prices are lower and selections broader.

Fishing equipment.—Sales of fishing equipment are forecast to reach $72 million in 1985. Approximately 80 percent of the 4 million fishermen in France are involved in freshwater sport, while the remainder participate in saltwater fishing.

Imports of fishing gear totaled $20.3 million in 1980, compared to $18.4 million in 1979 and $13.4 million in 1978. U.S. firms supplied around 3 percent of imports. Rods were the single most important item, accounting for 50.7 percent of imports by value in 1980; South Korean firms dominated the market with a 54-percent share. Imports of nonplastic reels were dominated by Japanese vendors who furnished 59 percent in 1980. Nets and accessories come primarily from Tunisia, with large amounts also shipped from Japan. Overall, fishing equipment imports increased 37 percent in 1979 and 10 percent in 1980.

Skiing equipment.—Sales of skiing equipment are forecast to approach $70 million in 1985. Based on an estimated 50 million skiers in the world, 10 percent reside in France. Between 1970 and 1980, the number of people taking skiing vacations in France increased 300 percent. During the 1980-81 season, 4.3 million skiers took sports holidays of 4 days or longer and of these, 87.6 percent were French citizens. In 1980, French ski resorts provided about 700,000 beds, representing an increase of 20,000 over 1979. The vast majority of facilities are in the Southern and Northern Alps, but new development has been recently successful in the Pyrenees, and this area attracted 600,000 skiers in 1980.

About 780,000 pairs of skis were sold in France during the 1980-81 season. Some 64 percent of these were alpine and 36 percent cross-country. The alpine market showed virtually no gains between the 1979-80 and 1980-81 seasons, following annual growth rates of 10 to 15 percent during the 1974 to 1979 period. Conversely, cross-country skiing is rising by about 20 percent each year. This growth is expected to stabilize at about 16 percent, with the alpine sector improving slightly to about 3 to 5 percent annually over the long term.

Historically, about 40 percent of alpine equipment has been imported, with the Austrian firms of Fischer, Kastle, Kneissl, Blizzard, and Atomic among the leaders. Rossignol, which claims 23 percent of the world alpine equipment market, estimates that with its affiliates it commands 45 percent of the French market. In cross-country, the largest supplier is Trak with a 46-percent share. Cross-country imports come primarily from the Nordic countries. In 1980, U.S. ski makers supplied 9.3 percent of imports, or 17,448 pairs.

During the 1980-81 season, 710,000 pairs of ski boots were sold in France, of which 430,000 (60.5 percent) were for alpine use. By comparison, 500,000 pairs were sold for alpine use in the 1979-80 season. Italian suppliers, led by Nordica, Garmont, and Munari, captured almost 80 percent of the market during the 1979-80 season, the last year that brand shares were available, with sales of 395,000 pairs. The lone French supplier, Trappeur, sold 60,000 pairs for a 12-percent share. Prominent U.S. suppliers include Lange, Hanson, and Scott.

In ski bindings, two French firms world leaders—

Salomon and Look—have regularly met 75 percent of alpine binding needs, which in the 1980-81 season amounted to 500,000 pairs. Of these, Look supplied about 47 percent. About 200,000 pairs of cross-country bindings were sold in the same season. The leading supplier is Trak. The ski binding market is closely related to ski sales and is currently growing at about 4 percent annually.

In ski poles, the French have a strong domestic industry dominated by Kerma which controls 60 to 70 percent of the market. The main material used is metal. Imports totaled $2.2 million in 1980, with 77.7 percent coming from Italian firms. No ski pole imports from the United States were recorded.

Bicycles.—Sales of bicycles in France are forecast to reach $382 million in 1985. There were about 14 million cyclists in 1980, and during that year 2,653,629 bicycles were delivered to the market—a 10-percent increase over 1979. More than 80 percent of these were from French suppliers. The market leader, as in previous years, was Peugeot with a 35-percent share, followed by Motobecane, 25 percent; Micmo-Gitane, 10 percent; and Le Jeune, 6 percent. Imports totaled $41.2 million in 1980, with 70 percent attributed to Italian firms. No imports were recorded from the United States in 1978 or 1979, but in 1980, U.S. firms sold $311,000 worth of bicycles in France.

Archery equipment.—According to the Federation Francaise de Tir a L'Arc, France boasts some 900 archery clubs and 48,000 archers, 18,000 of them licensed. The popularity of the sport is on the rise, as shown by the 20-percent annual increase in the number of archers during the 1978-81 period. Sales of archery equipment are expected to approach $3 million in 1985, a 7.5-percent average annual gain over the 1981 market when 14,900 bows and 250,000 arrows were sold.

The vast majority of equipment is imported, primarily from the Far East; Korean suppliers account for nearly 60 percent of the market. U.S. manufacturers, including Ben Pearson, are presently represented in the market, but primarily at the upper end with hunting equipment. French importers consider U.S. equipment to be generally too sophisticated for the market, although it has a good reputation and image. As the market develops, demand for U.S.-made goods is expected to mount. Currently, no one is supplying a good beginner's bow.

Gymnasium, gymnastic, and exercise equipment. The market for gymnasium, gymnastic, and exercise equipment in France is expected to top $50 million in 1985. Unlike most other product categories, the major portion of sales ($30 million) is expected to come from direct sales to local authorities, sports clubs, and sports centers. Firms most active in the market include the French companies Thomasson and Somms. French suppliers also enjoy a substantial trade with the former French colonies of Morocco, Tunisia, and Algeria. Demand for home exercise equipment, while smaller, is thought to be increasing substantially. Imports of athletic and gymnastic sports equipment amounted to $4.4 million in 1980, with most shipped from Germany and Italy. Imports from the U.S. totaled $243,000.

Inflatable balls.—The market for inflatable balls, which is suffering from a decline in the popularity of team sports, is expected to rise by 2.8 percent per year to $35 million in 1985. Footballs account for about 70 percent of sales, followed by volleyballs, handballs, rugby balls, and basketballs. Retail sales are shifting from sporting goods stores to supermarket chains and similar outlets.

Only a handful of local companies manufacture inflatable balls, so most are imported, primarily from countries such as Pakistan, Spain, and Hungary. No recent shipments have come from the United States.

Billiard and pool equipment.—Sales of billiard and pool equipment in France are forecast to total $1.9 million in 1985, growing by 2.8 percent yearly from 1981. Wholesaler and direct sales to institutions/businesses account for most of the total. Imports supply less than 15 percent of the market, and much of the trade is conducted by specialists outside of the sporting goods industry.

Skates.—Sales of skates are expected to decline to $1.6 million in 1985 from their 1981 level of $2 million. The market for ice skates was estimated at 50,000 pairs in 1980, of which 60 percent were figure skates and the remainder mainly hockey skates. In general terms, the upper end of the market is served by Canadian imports, such as Bauer; the middle by French suppliers (principally Alviera and La Soffadias) and other Canadian imports; and the low end by Taiwan.

The roller skate market was estimated at 500,000 pairs in 1980-81 and is growing at about 5 percent per annum. Patins Middon is the major French supplier in a strong domestic industry, but there are imports—mainly from Taiwan and a very small amount from the United States.

Baseball and softball equipment.—Sales of baseball and softball equipment in France are forecast to climb at an average annual rate of 7.5 percent from 1981, reaching $400,000 in 1985. Virtually all of the sales will be made through wholesale and direct channels or personal imports. Baseball and softball are very minor sports in France, usually played only by expatriate Americans. Most of the 2,500 licensed players bring in their own equipment from abroad.

Marine engines.—Sales of marine engines are forecast to rise more than 5 percent annually from $40.2 million in 1981 to almost $50 million in 1985. Nearly

50,000 outboard engines were imported in 1980, about 80 percent with capacities of less than 325 cubic centimeters. U.S. manufacturers, notably Evinrude/Johnson and Mercury, have long dominated this market, in part from overseas manufacturing plants, but the Japanese firm Yamaha has been gradually eroding their sales, especially of large engines. The Swedish firm Volvo recently entered the market and is cutting into small engine sales. No competition comes from domestic manufacturers.

Renault Marine, the only local builder of inboard engines, supplies from a third to a quarter of the market. Major foreign vendors include Volvo, Perkins, and BMS.

Travel trailers and motor homes.—Sales of travel trailers and motor homes in France are predicted to reach $496 million in 1985, representing a 3.7-percent average annual growth over the 1981 market. According to the Syndicat des Industries de La Caravannes des Vehicules et Residences Loisirs, there are just over one million caravans in France. In 1980, some 81,829 units were sold. Of these, 34,364 valued at $132.8 million were imported, primarily from Germany, Yugoslavia, and the United Kingdom. No imports were recorded from the United States, but U.S. units are known to be on the market, apparently shipped from other countries.

Approximately 3,000 motor homes travel French roads, and sales have recently averaged about 500 units per annum. Slightly more than a third of these units are to some degree self-constructed. This market is now believed to be almost static, as the original boom has quieted. Well-known U.S. products include General Motors' motor homes and motor home chassis made by Chrysler.

Profile of Sports and Recreational Activities

A decided shift in the French attitude toward sports took place during the 1970's, and participation increased about 6 percent per annum over the decade. This growth is attributed, not to a particular love of sport, but more to a rising interest in personal health, specifically weight maintenance. The increasing availability of leisure time and new sports facilities also contributed to this trend.

The direction of this continuing shift has been toward individual sports, such as tennis and skiing, and away from team sports, such as soccer and rugby. Several reasons have been suggested for this trend, including a breakdown of the nuclear family, a desire for greater individualism stemming from a more liberal modern lifestyle, and a desire for more intense personal competition. Also, one-against-one and one-against-nature sports tend to take up less time than organized games and allow more flexibility than team sports, which require coordination and planning among the participants. Still, compared with their English and German neighbors, the French are not particularly sports oriented and devote far less time to sports education in the curriculum at school or college.

Table 3. France:—Imports of sporting goods from the United States by product category, 1980-81 and forecast 1983 and 1985

(millions of U.S. dollars)

			Forecast	
	1980	1981	1983	1985
Racket sports	2.9	4.2	4.4	4.9
Golf	1.0	.3	.4	.8
Fishing	.6	.6	.7	.9
Skiing	1.6	.9	1.2	1.8
Bicycles	.3	–	–	–
Archery	.1	.1	.1	.2
Gymnastic equipment	.2	.6	.8	1.5
Inflatable balls	–	–	–	–
Billiard and pool	–	–	–	–
Skates	.1	.1	.1	.1
Baseball	–	–	–	.1
Marine engines	6.1	2.5	4.4	4.9
Travel trailers	–	–	.1	.3
Totals	12.9	9.3	12.2	15.5

Source: International Trade Administration, Office of Trade Information Services research report.

Successive French Governments have recognized the need to improve their nation's health and have funded schemes for better and more widespread sports facilities, especially in urban areas. The priority of such programs under the recently elected Government is unclear, nor is it known which sports will benefit from them.

Sports participation is also fostered by several government-backed sports federations in France. These groups organize and administer their particular activities on a national level and license players/participants that belong to registered clubs.

Amongst adults, 34.4 percent undertake some kind of sporting exercise, according to a 1979 study by the Secretariat d'Etat a La Jeunesse et Aux Sports. Of these, 51 percent do so regularly, 36 percent from time to time, and 13 percent only when on vacation. Some type of gymnastic or keep-fit exercises are undertaken by 18.6 percent of the population, with 25.4 percent taking part in individual sports and 12 percent in team sports. Over 40 percent of men engage in sports, but only 28 percent of women. The incidence of sports participation follows the age profile in a declining curve.

Marketing Practices

Marketing channels for sporting goods have been changing recently, with a decline in wholesaler/middleman activities and more direct links between the supplier, whether domestic or foreign, and the retailer.

Department stores and other bulk-purchasing organizations, as well as smaller retail outlets grouped into buying federations, are all seeking new ways to cut costs and improve profit margins. Manufacturers eager to move inventory have even begun to sell directly to sports clubs, even though this is technically illegal. All these activities are taking place against a backdrop of general economic difficulties, but many believe that sporting goods marketing channels have been altered permanently.

The seasonality of purchases remains unchanged. Winter sports products are essentially ordered in spring for sale in autumn and winter; summer sports products are ordered in late autumn for sale in spring and summer.

Most sporting goods organizations use regional sales agents who are paid a commission on sales, as a fulltime sales force is too costly. Commission levels vary from 4 to 15 percent. Agents often represent several brands to ensure sufficient income. A supplier generally needs 6 to 7 agents in France, although some organizations have 12 to 15. In some cases, manufacturers can coordinate their sales staffs so that, for example, a tennis ball vendor works with a racket supplier in sales and, perhaps, even in warehousing and distribution. This type of cooperation can also boost sales.

Poor economic conditions in France have led to extended payment terms. Formerly retail terms were 45 to 60 days; however, the average settlement period was recently quoted as 82 days, and bad debts are at very high levels. Financially sound buying groups and department stores are the beneficiaries and often receive discounts for prompt payments.

Suppliers generally look for a 25- to 40-percent gross return. An importer works to the high end of this scale, primarily as a hedge against currency fluctuations and administrative costs involved in importing. Retailers work on a markup system for their profits. Markups range from about 1.25 to 2 times wholesale cost, depending on the product and type of retailer. Markups may be higher in department stores, but this is often offset by a manufacturer discount. The retail price maintenance system does not exist in France (or any other EEC country), and a supplier may not refuse a buyer who wishes to purchase his goods.

Trade Regulations

France levies no import duties on goods from other Common Market nations or from developing countries. U.S. products are subject to tariffs based on the c.i.f. value; the amount of the tariff is based on the type of sporting equipment. Recently, most U.S.-made sporting goods are subject to 8.2 percent tariff. Higher rates have been levied on tennis rackets (11.2 percent) and bicycles (17 percent) and lower rates have been charged for unmounted fish hooks (4.6 percent) and tennis gut strings (5.4 percent).

Most goods entering France must be accompanied by a certificate of origin and are also subject to a value-added tax, currently 17.6 percent, charged at port of entry on c.i.f. value. Goods are not released until payment is made and certificate of origin produced. The importer usually recovers the tax when the goods are resold. No nontariff barriers apply to U.S. products, although certain categories (such as caravans, motor homes, and outboard engines) must comply with French safety and health regulations.

France uses the metric system. Export sales literature should include metric equivalents, where appropriate, and be in the French language or accompanied by a French language translation.

Additional Information

The project officer responsible for Country Market Surveys on Sporting Goods and Recreational Equipment is:

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Sporting Goods and Recreational Equipment

Germany

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The German market for sporting goods and recreational equipment totaled $1.3 billion[1] in 1981 (see table 1) and is forecast to approach $1.7 billion in 1986, growing an average 4.8 percent annually. Retailers handled nearly 85 percent of sales in 1981; sports shops accounted for 45 percent of these sales, department stores for 18 percent, and mail order for 9 percent.

Germans have long been great sportsmen, and sporting activities are increasing. However, the recent economic downturn has reduced consumer spending, and participants are looking for more value for the money in their leisure pursuits. For example, they are replacing equipment on a much less regular basis than formerly.

The slowdown in buying has resulted in oversupply. During the 1980/81 winter season, skis were sold at almost list prices. Similar price wars have occurred in the racket sport field, which had been one of the most dynamic categories in the German sporting goods field as the market moved from team to individual sports.

While sales of sporting goods will not likely achieve the overall meteoric rise of the seventies, the substantial market (which is not predicated on fads) will continue. Equipment will wear out; much is constantly turned over. Many sports which have enjoyed long-standing popularity in the United States but not in Germany (such as golf) show the highest current rates of growth. In such areas, American expertise and competitive advantages should provide a growing edge in the German market.

Competitive Environment

German manufacturers satisfy most of local demand for sporting goods and recreational equipment. Two domestic producers are outstanding: the giant Adidas and its rival, Puma. Building from a footwear base, Adidas has expanded into almost every sporting goods market. Adidas and Puma carry on an intense rivalry within the home market. However, as they have expanded, they have moved away from German production bases. The Adidas tennis racket, for example, is manufactured in Taiwan. Each company also is quick to buy components abroad and manufacture domestically.

Few other German manufacturers have managed to establish such dominant positions, and exports amount to only about a third as much as imports. Well-known firms include Marker and Geze in ski bindings; Voelkl, Erdbacher, and Pilz in skis; Voelkl and Adidas in tennis rackets; Derby Star in inflatable balls; Kettler in gymnastic and exercise equipment; Burstner in mobile homes; and BMW in outboard engines.

German imports of sporting goods and recreational equipment dropped from $479 million in 1980 to a still substantial $281 million in 1981. U.S. manufacturers accounted for 5 percent of foreign shipments, with skis, water sport equipment and tennis rackets the most important products. The best future prospects appear to be in cross-country skis and hunting weapons, with tennis balls and rackets, squash rackets, golf clubs, cross-country boots, gymnastic equipment, and ammunition offering potential profits.

American products in general have good reputations in Germany. However, manufacturers could improve their sales considerably by heeding German criticisms of their operations, such as lack of commitment to export markets, inability to deliver on time, poor communication with overseas partners, unrealistic assessment of local demand and marketing needs, lack of effective sales support and backup, lack of protection for distributors, and different attitudes toward commercial practices (specifically German law giving greater protection to the local agent/importer than U.S. law).

Product Market Profiles

Equipment for racket sports.—Racket sports are very popular in Germany. In 1981, an estimated 1.9 million Germans participated in tennis; 77 percent belonged to clubs. This number represented an average annual gain of 13 percent during 1977-81. The Deutscher Tennis Bund predicts a further 7-8 percent increase over the next 5 years. Thus, one out of every 32 people in the country are players. In 1980, there were 24,503 courts in use throughout Germany of which 86 percent were shale/clay, 7 percent cement, 6 percent in closed halls, and 1 percent in halls that could be opened in good weather.

Equipment sales totaled $64.9 million in 1981 and are forecast to grow 6 percent annually to $87 million in 1986. In 1980, 790,000 rackets were sold, 675,000 through retail outlets; 78 percent of retail sales were through the independent sports trade and the remainder through department stores and mail order outlets.

The market leader in 1980, Donnay of Belgium, supplied 18.3 percent of sales. Voelkl followed with a 13.8-percent share. The former had considerable strength in department store sales; the latter was stronger in the independent sports trade. Snauwaert and Dunlop, with 9-percent and 8-percent shares, respectively, were next, followed by Head (United States) with a 7-percent share. Thirteen major brands accounted for 75 percent of the total market. Half the rackets offered by major suppliers were wood,

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1 = DM2.01 (1978), DM1.83 (1979), DM1.82 (1980), and DM2.26 (1981 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

Table 1.—Germany: Sales of sporting goods and recreational equipment, 1980-81, 1983 and 1986
(in millions of U.S. dollars)

	1980	Estimated 1981	Forecast 1983	Forecast 1986
Equipment for racket sports				
Retail sales	52.9	56.6	60.7	69.5
Wholesaler/manufacturer sales to institutions/businesses	7.8	8.3	11.9	17.5
Total	60.7	64.9	72.6	87.0
Golf equipment				
Retail sales	7.5	9.5	10.5	13.6
Wholesaler/manufacturer sales to institutions/businesses	1.0	1.2	1.6	2.0
Total	8.5	10.7	12.1	15.6
Fishing equipment				
Retail sales	49.0	50.3	52.5	58.3
Wholesaler/manufacturer sales to institutions/businesses	3.2	3.3	3.4	3.8
Total	52.2	53.6	55.9	62.1
Skiing equipment				
Retail sales	130.9	124.9	132.6	144.8
Wholesaler/manufacturer sales to institutions/businesses	33.0	31.5	33.4	36.5
Total	163.9	156.4	166.0	181.3
Bicycles				
Retail sales	474.6	455.5	531.8	669.1
Wholesaler/manufacturer sales to institutions/businesses	16.6	16.0	18.6	23.5
Total	491.2	471.5	550.4	692.6
Gymnasium, gymnastic, and exercise equipment				
Retail sales	26.7	27.9	33.8	49.2
Wholesaler/manufacturer sales to institutions/businesses	71.3	74.4	90.0	131.1
Total	98.0	102.3	123.8	180.3
Inflatable balls				
Retail sales	21.8	19.9	20.4	21.9
Wholesaler/manufacturer sales to institutions/businesses	12.7	11.8	12.0	13.0
Total	34.5	31.7	32.4	34.9
Billiard and pool equipment				
Retail sales	6.1	5.8	5.9	6.2
Wholesaler/manufacturer sales to institutions/businesses	3.8	3.6	3.7	4.0
Total	9.9	9.4	9.6	10.2

Table 1.—Germany: Sales of sporting goods and recreational equipment, 1980-81, 1983 and 1986—Continued
(in millions of U.S. dollars)

	1980	Estimated 1981	Forecast 1983	Forecast 1986
Skates (ice and roller)				
Retail sales	158.7	32.3	33.1	35.2
Wholesaler/manufacturer sales to institutions/ businesses	26.4	5.4	5.5	5.9
Total	185.1	37.7	38.6	41.1
Hunting arms and ammunition				
Retail sales	89.9	94.2	103.8	120.2
Wholesaler/manufacturer sales to institutions/ businesses	35.2	36.9	40.7	47.1
Total	125.1	131.1	144.5	167.3
Archery equipment				
Retail sales	5.0	5.4	5.9	6.6
Wholesaler/manufacturer sales to institutions/ businesses	3.1	3.4	3.7	4.2
Total	8.1	8.8	9.6	10.8
Marine engines				
Retail sales	27.3	28.4	31.3	36.1
Wholesaler/manufacturer sales to institutions/ businesses	7.8	8.1	8.9	10.3
Total	35.1	36.5	40.2	46.4
Travel trailers				
Retail sales	290.2	220.9	178.9	162.1
Wholesaler/manufacturer sales to institutions/ businesses	10.9	8.3	6.7	6.1
Total	301.1	229.2	185.6	168.2
Totals				
Retail sales	1,340.6	1,131.6	1,201.2	1,392.8
Wholesaler/manufacturer sales to institutions/ businesses	232.8	212.2	240.1	305.0
Grand total	1,573.4	1,343.8	1,441.3	1,697.8

Source: International Trade Administration, Office of Trade Information Services research study, The Market for Sporting Goods and Recreational Equipment—Germany (see Additional Information box).

13.6 percent metal, and 35.7 percent fiber. The market for wood rackets shrank from 71 percent in 1977 to 54 percent in 1981; metal declined from 12 percent to 6 percent and metal/metal fiber increased from 17 to 40 percent.

Ski equipment.—During the winter sport season of 1980/81, an estimated 10.5 million Germans were on the slopes at least once. Almost 7 million engaged in alpine skiing and 6.3 million in cross country. A recent survey concluded that 45 percent of the skiers ski for more than 15 days a year. As expected, frequency is greater in the southern areas of the country where inhabitants have both easier and cheaper access to the slopes.

During the same season, 1.4 million pairs of skis were sold through retail outlets, making Germany the largest market in the world, far ahead of Japan with 900,000 pairs sold and the United States with 850,000 pairs. Of the skis sold in 1980/81, 815,000 pairs were alpine and 564,000 were cross country. Alpine skis accounted for a larger share in 1978/79, declined slightly in relation to cross country in the following years, then rose once more in 1980/81.

Approximately 60 suppliers are active in the ski market, offering a combined total of more than 2,000 models. Three domestic companies—Voelkl, Erdbacher, and Pilz—are important suppliers of skis, but the major suppliers are from Austria, accounting for 66 percent of imports in 1980. French companies, mainly those in the Rossignol group, furnished 10 percent of imports, (see table 2).

A total of 1.3 million pairs of ski boots were sold in 1980-81; some 58 percent were alpine and 42 percent cross country. The total again represents a slight decline (2 percent) from the preceding year. An estimated 85 percent of alpine boots and 72 percent of cross-country ski boots were sold via specialty shops.

Sales of bindings rose 9 percent in 1980/81 from 625,000 to 684,000; more than 80 percent were sold via the specialty houses. However, imports which play a pivotal role in skis (accounting for 88 percent in 1980) are less important in bindings. Marker and Geze are important domestic contributors to the market, supplemented by the French companies Salomon and Look and Tyrolia of the United States.

Bicycles.—Over 30 million bicycles are in use in Germany, virtually one for every two citizens. German manufacturers are more important as exporters than importers. Domestic production declined from 3.6 million in 1980 to 3.5 million units in 1981; simultaneously, imports showed a very slight rise while exports declined modestly. Since 1979, Dutch suppliers have accounted for 40 percent of imports with another 20 percent coming from French producers. Purchases of Italian bicycles have shown a substantial decline in this period, balanced by an increase in sales of Austrian products.

Travel trailers and mobile homes.—German firms have been important makers and exporters of travel trailers and motor homes. Although production has been declining, 62,779 units valued at $312 million, were built in 1981.

The decline in production of travel trailers has been matched by a decline in registrations which fell from a peak of 41,658 in 1978 to 31,406 in 1981. However, motorhome registrations have continued to rise, although the trend appears to be ending; 1981 registrations grew only slightly in marked contrast to healthy gains in the preceding years. German manufacturers tend to export almost half their production.

Profile of Sports and Recreational Activities

The German passion for sports is reflected in the number of members in national sports bodies (see table 3). Major sports include football, gymnastics, tennis, and shooting. Of special interest is the current lowly position of golf; sales of golfing equipment are rising sharply, suggesting that this sport, so popular in other Western nations, might well be headed for greater German participation.

Out of a population of 46 million people aged 14 or older, 32 percent partake in some kind of sporting activity. Nearly 39 percent of all adult men and 26 percent of women engage in sport or sports. The Nordrhein-Westfalen (North Rhine-Westphalia) region dominates in number of sports clubs (15,335 in 1980 or 29 percent of the German total) and also has the most members (3.5 million or 25 percent). Bayern, Baden-Wurttemburg, Niedersachsen, Hessen, and Rheinland-Pflaz also have large numbers of clubs.

Marketing Practices

The German sporting goods industry—with the exception of national giants such as Adidas and Puma—depends heavily upon sales agents who carry their own costs and earn commissions for sales generated within their territories. German agents are quite sophisticated; many offer warehousing and invoicing facilities in addition to normal services. Commissions vary extensively, generally falling in the 7-8 percent range, rising to 10-12 percent on special items; stockholding and invoicing add 2 to 4 percent. Specialized items with small, clearly defined end-user bases generally require 4 to 5 agents; more mass marketed items may require up to 12. Complementary products commonly find shared sales organizations and warehousing facilities. The German market is notorious for wheeling and dealing; list prices are little more than starting points for negotiations. However, department stores and major retailers are known to gain discounts several percentage points above those awarded the smaller independent retailers. For this reason, many purchasing cooperatives have been established.

The average retailer has an 80 to 90 percent markup (including the local sales tax of 13 percent); department stores and other bulk buyers operate on a 220-230 percent markup basis.

Germany follows a 6-month seasonal purchasing pattern. Winter products are ordered by retailers in the spring for autumn delivery; summer products are ordered in the autumn for spring delivery. The large sporting goods trade fairs of ISPO in Munich (twice yearly) and SPOGA in Cologne offer retailers the chance to examine all principal brands of merchandise at one location for 4 days. Major buying groups generally place orders at the fairs; independents generally await the specialized regional fairs, run by sales agents, which follow the major fairs by about a month.

The market glut at present has shortened the time for placing bulk orders. Retailers have seized the opportunity to wait to the last minute. The oversupply resulted in great uncertainty in many categories (especially skis and rackets) with tremendous price fluctuations on identical products depending upon point of sale.

Table 2.—Germany: Imports of sporting goods and recreational equipment, 1979-81
(in thousands of U.S. dollars)

	1979	1980	1981
Tennis rackets			
United States	2,055	2,623	2,220
Benelux	5,352	5,993	4,401
Austria	3,645	4,499	3,954
Taiwan	1,416	1,701	1,673
All others	4,592	5,573	4,132
Total	17,060	20,389	16,380
Badminton and other sports rackets			
United States	–	–	53
Taiwan	2,328	2,346	2,869
United Kingdom	902	89	833
Japan	208	35	434
All others	1,259	2,666	425
Total	4,697	5,136	4,614
Sports balls (rubber)			
United States	150	750	548
Ireland	880	2,637	2,892
United Kingdom	2,398	2,231	2,256
South Africa	105	402	375
All others	1,345	1,282	1,535
Total	4,878	7,302	7,606
Gut strings			
United States	111	181	158
France	3,348	2,508	2,595
Spain	5,567	4,308	2,446
Malaysia	1,038	996	1,119
All others	1,331	1,993	1,173
Total	11,395	9,986	7,491
Unmounted fish hooks			
United States	–	–	–
Japan	82	164	140
South Korea	47	132	129
Norway	132	315	77
All others	354	415	261
Total	615	1,026	607
Fishing reels			
United States	131	142	121
Japan	3,471	3,295	2,715
South Korea	1,755	2,018	1,675
Sweden	535	633	226
All others	324	526	438
Total	6,216	6,614	5,175
Fishing rods			
United States	177	139	95
South Korea	3,990	6,409	4,008
Japan	2,373	2,817	2,350
United Kingdom	758	937	363
All others	1,673	1,920	1,468
Total	8,971	12,222	8,284
Skis			
United States	4,087	4,717	3,859
Austria	37,451	37,209	28,339
France	9,038	7,604	5,332
Italy	3,218	1,709	1,798
All others	7,560	5,969	3,727
Total	61,354	57,208	43,055
Ski bindings			
United States	143	311	58
Austria	8,696	8,592	5,556
France	5,020	5,464	4,462
Japan	2,264	993	1,840
All others	2,038	1,514	1,318
Total	18,161	16,874	13,234
Ski accessories (including poles)			
United States	95	270	51
Italy	1,043	1,842	1,507
Finland	801	1,016	1,023
Austria	1,007	1,013	1,014
All others	3,134	3,231	1,975
Total	6,080	7,372	5,570
Ski boots			
United States	–	–	–
Italy	2,027	2,520	2,552
Yugoslavia	1,684	1,758	1,512
Austria	771	455	670
All others	1,295	1,893	782
Total	5,777	6,626	5,516
Bicycles			
United States	–	382	164
Netherlands	21,355	33,338	29,362
France	11,943	20,684	18,561
Austria	3,349	8,436	9,523
All others	9,615	14,745	14,410
Total	46,262	77,585	72,020
Gymnastic/exercise equipment			
United States	846	401	704
Italy	1,771	1,762	1,203
United Kingdom	1,347	1,134	973
Sweden	1,118	1,362	933
All others	3,334	4,694	4,120
Total	8,416	9,353	7,933
Sports balls (leather outers)			
United States	–	–	–
India	5,859	4,221	3,494
Pakistan	2,229	2,649	2,228
Hungary	2,016	1,744	1,776
All others	5,723	5,738	3,877
Total	15,827	14,352	11,375
Sports balls (others)			
United States	345	464	556
Ireland	1,138	787	835
Pakistan	–	113	628
South Korea	671	647	614
All others	4,257	3,994	2,648
Total	6,411	6,005	5,281

Table 2.—Germany: Imports of sporting goods and recreational equipment, 1979-81—Continued

(in thousands of U.S. dollars)

	1979	1980	1981
Billard and pool equipment			
United States	1,965	1,534	836
Switzerland	–	191	419
Italy	723	600	360
Benelux	133	362	227
All others	1,183	1,122	487
Total	4,004	3,809	2,329
Ice skates			
United States	–	299	–
Taiwan	1,759	4,171	4,603
Yugoslavia	1,850	2,742	2,165
Canada	580	1,996	1,615
All others	7,367	8,872	4,996
Total	11,556	18,080	13,379
Roller skates			
United States	852	1,623	106
Taiwan	4,542	61,549	2,720
Hong Kong	–	2,142	189
South Korea	–	1,722	112
All others	1,683	9,900	221
Total	7,077	76,936	3,348
Parts for ice and roller skates			
United States	344	679	157
Canada	270	641	505
Italy	73	146	151
Switzerland	93	–	97
All others	566	51,777	272
Total	1,346	53,243	1,182
Hunting rifles (Flint)			
United States	255	359	NA
Italy	3,019	4,144	NA
Japan	1,696	1,643	NA
United Kingdom	279	642	NA
All others	1,534	1,429	NA
Total	6,783	8,217	NA
Hunting rifles			
United States	498	1,226	NA
Austria	2,289	1,877	NA
United Kingdom	198	286	NA
Italy	109	190	NA
All others	690	712	NA
Total	3,784	4,291	NA
Hunting rifles (others)			
United States	–	–	NA
Austria	900	965	NA
Benelux	756	591	NA
Italy	226	480	NA
All others	859	951	NA
Total	2,741	2,987	NA
Sporting weapons			
United States	233	200	NA
Italy	820	1,020	NA
Spain	120	133	NA
United Kingdom	73	126	NA
All others	184	129	NA
Total	1,430	1,608	NA
Small hunting cartridges			
United States	214	302	163
Hungary	154	199	493
Italy	1,122	1,229	361
France	–	66	224
All others	640	291	555
Total	2,130	2,087	1,796
Other hunting cartridges			
United States	468	487	602
Austria	338	205	232
Finland	224	238	114
Czechoslovakia	48	131	110
All others	750	497	263
Total	1,828	1,558	1,321
Sports cartridges			
United States	468	487	940
Italy	80	–	1,715
United Kingdom	355	313	617
Austria	338	205	476
All others	598	553	1,404
Total	1,839	1,558	5,152
Other bullets and sports cartridges			
United States	227	179	182
Italy	467	392	89
France	–	57	–
All others	97	56	37
Total	791	684	308
Cartridge shells and detonators			
United States	–	–	113
Yugoslavia	115	137	355
Austria	231	222	134
France	–	–	124
All others	488	1,538	190
Total	834	1,897	916
Other bullets and ammunition			
United States	414	565	520
United Kingdom	–	113	143
France	–	–	66
Italy	44		59
All others	712	383	160
Total	1,170	1,061	948
Outboard engines (up to 325 cm³)			
United States	440	–	–
Benelux	2,324	3,057	2,021
Japan	2,416	2,900	1,669
Netherlands	333	349	681
All others	1,101	1,081	154
Total	6,614	7,387	4,525
Outboard engines (over 325 cm³)			
United States	977	863	312

Table 2.—Germany: Imports of sporting goods and recreational equipment, 1979-81—Continued
(in thousands of U.S. dollars)

	1979	1980	1981
Benelux	4,213	3,029	2,215
Japan	2,079	1,806	1,050
Netherlands	88	78	121
All others	1,721	282	129
Total	9,078	6,058	3,827
Caravans			
United States	–	187	84
France	16,946	21,005	19,996
Yugoslavia	3,245	2,837	4,445
Denmark	691	804	589
All others	5,331	4,248	2,452
Total	26,213	29,081	27,566
Totals			
United States	15,495	19,370	12,602
Grand totals	311,338	478,592	280,738

Source: Official German trade statistics.

Under normal circumstances, the industry is marked by prompt settlement terms and discounts with a complex system of forward financing (resented by the vendor because it carries no guarantee that purchase orders will be fulfilled). Terms vary considerably, but most firms offer 3-percent prompt settlement discount in 10 days. However, small outlets in particular, are securing settlements of 90 days in the present tempestuous economy.

A notable feature of the German market is the presence of local subsidiaries established by American and other non-German suppliers. These subsidiaries were considered necessary because of the large size of the market, lack of few national distributors, and desire for the supplier to exercise direct control. Local subsidiaries are expensive undertakings; most were established in the less expensive days of market expansion, and their presence often stands in the way of would-be competitors establishing similar operations under today's high cost conditions.

Retail distribution is in a state of great flux. Approximately 4,248 outlets which sell sporting goods are established in Germany, with the greatest concentration occurring in the Munich district (accounting for 22 percent of total outlets); Berlin has the fewest outlets with a scant 2-percent share. Of the outlets, 2,210 are specialty stores (one for each 27,900 citizens). In addition, 350 department stores and mail order firms sell sports hardware. Of the specialty retailers, about 1,000 belong to joint buying and promotional syndicates; the three most influential are Intersport, Zentrasport, and Munchener Sport-Einkaufsgenossenschaft (MSE) which have national representation. In addition, several regionally based groups exist as supplementary purchasing groups. The remaining 1,210 outlets operate independently and include two of Europe's largest sporting goods shops, Sport-Scheck and Sport Schuster (located near one another in central Munich).

Of the department store outlets, four are principally concerned with sporting goods: Karstadt, Hertie, Kaufhof and Horten. Karstadt is of special importance since it has established a chain of sports department stores, selling only sporting goods and travel services.

Certain sports such as tennis and golf have high proportions of direct sales—either to individuals or the clubs themselves. Leading tennis players and coaches believe that 20 percent of all tennis equipment turnover in Germany will be direct sales by the end of 1982.

The main trend in the industry has been the steady erosion of the once dominant specialist retailer (originally often a retired sport celebrity who invested in his own small shop and achieved a small area monopoly) caused by the department stores and other chain-type organizations. The specialty retailer usually ran a one-man operation and was naive about business. Growth in the sportswear sector influenced certain department stores and other general merchandise outlets which had eschewed equipment to create new sporting goods departments. By the end of the 1970's (at the peak of market expansion), considerable friction had arisen between the traditionalists and newcomers. Suppliers were caught in the middle: realizing the dynamism of the new entrants, yet sorry to place their old customers at

Table 3.—Germany: Licensed membership in national sports bodies, 1980

	Men	%	Women	%	Total
Football	3,936,706	91	384,598	9	4,321,304
Gymnastics	1,074,668	35	1,991,987	65	3,066,655
Tennis	702,997	55	566,236	45	1,269,233
Shooting	899,261	84	170,010	16	1,069,271
Athletics	414,677	56	328,327	44	743,004
Handball	480,415	70	200,792	30	681,207
Table tennis	466,213	73	168,145	27	634,358
Swimming	306,064	52	284,630	48	590,694
Skiing	292,608	60	194,961	40	487,569
Lifesaving	293,453	61	189,034	39	482,487
Volleyball	129,821	54	109,640	46	239,461
Judo	156,843	75	51,795	25	208,638
Sailing	128,345	81	30,656	19	159,001
Ice and roller skating	79,431	66	40,172	34	119,603
Canoeing	59,316	67	28,954	33	88,270
Basketball	53,619	66	27,156	34	80,775
Racing cycling	54,977	77	16,432	23	71,409
Badminton	39,260	56	30,016	44	69,276
Rowing	54,013	79	14,700	21	68,713
Wrestling	68,109	100	–	–	68,109
Golf	25,619	56	20,242	44	45,861
Boxing	35,289	93	2,767	7	38,056
Fencing	15,569	67	7,809	33	23,378

Source: Deutscher Sport Bund.

the competitive disadvantage which is the lot of the small buyer. However, soon the large outfits demanded the major brands and were granted their wishes, despite retaliatory threats from the independents.

The dwindling market has resulted in exits by some of the non-sports retailers, but most have become solidly entrenched. The specialists, on the other hand, have concentrated on a specific sport and justify high prices by technical expertise and personal attention. Owners have also grown more businesslike and joined buying cooperatives. Pre-tax profits among the independents, however, have dropped from a 3.2 percent high in 1977 to 0 in 1981; thus, many will likely be forced out of business. The final results are the current price wars.

Another recent trend has been retailers' direct dealings with manufacturers (both foreign and domestic), thereby avoiding the need for wholesalers. This results in better terms and prices for retailers. In fact, many specialists (not to mention department stores) are buying their own label merchandise from the Far East.

Trade Regulations

Germany uses the metric system of measurement. Specialized measuring criteria are required for weapons, ammunition, marine engines, travel trailers and mobile homes.

The 10 member nations of the Common Market have no restrictions on goods moving between one another; relevant documentation must be included. U.S. products are subject to a flat level of duty (with minor exceptions) which range from 17 percent CIF for bicycles to 4.7 percent for fishing hooks. All goods covered in this report can be exported to Germany, but highly technical goods such as motor homes and marine engines must comply with local health and safety regulations. Special clearances are mandatory for hunting weapons and ammunition. In addition to the duty levied on c.i.f. value of goods, an import tax of 13 percent is assessed. This, however, can be offset against the sales tax on goods sold to a third party.

All goods must contain a certificate of origin without which Customs will refuse release and may impose storage charges pending compliance.

Four to 6 weeks is a reasonable amount of time to allow when goods are shipped by sea to Germany from the United States.

Additional Information

The project officer responsible for Country Market Surveys on Sporting Goods and Recreational Equipment is:

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:
International Market Research Services
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Washington, D.C. 20230
Telephone: (202) 377-2988

The Survey summarizes a 158-page research report prepared by Woodbridge and Associates, Munich, West Germany, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
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When placing an order for this research, please request "The Market for Sportigg Goods and Recreational Equipment—West Germany," ITA 82-08-512, May 1982.

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Country Market Survey

DEPOSITORY
JUL 26 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Graphic Industries Equipment

Switzerland

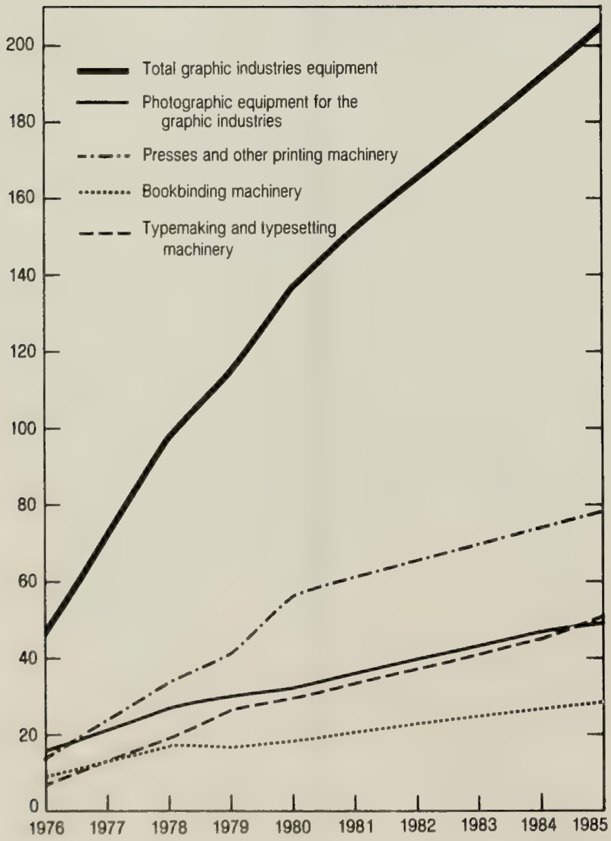
U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Reacting to a combination of high wages and relatively low interest rates, Swiss printers plan continued sizable investments in advanced labor-saving equipment to meet the growing demand for high-quality printed matter at home and abroad. Expensive energy also provides the printing industry with an incentive to replace old machines with new energy efficient types or to adapt existing equipment. Purchases of graphic industries equipment are projected to rise from nearly $137 million[1] in 1980 to $206 million in 1985 (see table 1 and figure 1), an average annual increase of 8.6 percent. Although substantial, this represents a drop from the enormous 31-percent yearly growth in the market from 1976-80 when Swiss printers were in the midst of the technological revolution in printing.

Typemaking and typesetting machinery.—The market for typemaking and typesetting machinery is expected to grow by more than 11 percent annually during the 1980-85 period to $50.5 million, as Swiss printers continue to modernize. With about half of all typesetting still carried out on hot-metal equipment, good sales potential exists for phototypesetting equipment of all kinds. The market for tape-driven phototypesetting machines with cathode ray tubes (CRT's), for example, is projected to grow at a phenomenal 20 percent a year, reaching $15 million in 1985 (see table 2). In some cases, the new generations of direct entry or high-speed CRT units offered now make the older machines obsolete. The average value of newly installed phototypesetting machines will increase since more intelligence and many more periperals are being added to direct entry units and systems. Demand for software for phototypesetting operations is strong, since hyphenation and justification of lines is a major problem for the printing industry.

Figure 1.—Switzerland: The market for graphic industries equipment 1976-1985

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research study.

Swiss printers are turning toward magnetic data carrier techniques in phototypesetting systems. Diskettes are the most popular means of entering, storing, and transmitting texts, with rigid magnetic disks being used in systems priced over $50,000.

Increased use of photocomposition techniques is also expected to add to market potential. Some electronic full-page composition systems are already in operation, and more are expected to be installed because experience with the existing ones has been good.

Rotary letterpresses are expected to continue in widespread use but, as many of them will be equipped to print with polymer plates or use dilitho techniques, no hindrance to sales of phototypesetting equipment is anticipated. New letterpresses are even acquired specifically to be used with polymer plates, notably at the printing plant of the daily newspaper Neue Zurcher Zeitung. Swiss printers have found this combination to be very cost efficient, leading to a rising market for platemaking equipment.

Photographic equipment.—Sales of $49 million in 1985 are forecast for photographic equipment, an average yearly increase of 9 percent over 1980 sales. The Swiss printing industry has already made large investments in process cameras and developing equipment, much of it incorporating the latest techniques, but a strong market is still expected due to rapid innovation. Current trends include the introduction of developing lines, daylight equipment, and electronic scanning and laser techniques. High-grade electronic scanners are expected to supercede conventional color separation systems. Sales prospects are especially good for advanced electronic cameras and developing machines.

Smaller printshops and service bureaus specializing in art copy preparation are attracted to relatively low-priced, compact equipment. The large shops and reproduction services want large vertical electronic process cameras, which guarantee high-quality

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=Sf2.50 (1976), Sf1.79 (1978), Sf1.66 (1979), and Sf1. 67 (1980 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 1.—Switzerland: Size of market[1] for graphic industries equipment by major subcategories, 1976, 1978-80, and projected 1985

(in millions of U.S. dollars)

	1976	1978	1979	1980	1985
Typemaking and typesetting machinery					
Production	5.60	23.20	24.80	24.20	45.0
Imports	5.25	12.04	18.49	21.84	36.5
Exports	3.66	16.20	16.87	16.49	31.0
Market size	7.19	19.04	26.42	29.55	50.5
Photographic equipment for the graphic industries					
Production	5.50	8.50	10.50	11.50	17.5
Imports	13.50	23.00	25.50	27.00	39.5
Exports	3.50	4.50	6.00	6.50	8.0
Market size	15.50	27.00	30.00	32.00	49.0
Presses and other printing machinery					
Production	48.00	93.40	92.60	110.30	155.0
Imports	10.30	25.40	32.80	48.90	65.0
Exports	43.90	85.00	84.30	102.60	142.0
Market size	14.40	33.80	41.10	56.60	78.0
Bookbinding machinery					
Production	46.20	88.50	94.80	109.70	175.0
Imports	2.39	6.47	7.41	8.58	14.0
Exports	39.28	77.85	85.33	99.86	160.5
Market size	9.31	17.12	16.88	18.42	28.5
Totals					
Production	105.30	213.60	222.70	255.70	392.5
Imports	31.44	66.91	84.20	106.32	155.0
Exports	90.34	183.55	192.50	225.45	341.5
Market size	46.40	96.96	114.40	136.57	206.0

[1] Market size equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Parts and accessories are not included.

Source: International Trade Administration, Office of Trade Information Services research study, The Market for Graphic Industries Equipment—Switzerland (see Additional Information box).

copies and permit printing of large posters and maps.

Automated film processing is becoming standard procedure even in small and medium-sized establishments, assuring a good market for developing machines. Swiss printers readily accept low-priced developers with a favorable return-to-investment ratio.

Presses and other printing machinery.—Swiss printers have already invested heavily in efficient pressroom machinery and anticipate 1985 purchases of $78 million, a relatively modest 6.6 percent average yearly increase between 1980 and 1985. Strong demand is expected, however, for several specific items, including:

Medium-sized web-fed rotary offset presses
Sheet-fed offset presses
Multicolor presses
Flexographic presses
Label printing presses

Sales of rotary web-fed offset machines are projected to advance an average 10 percent annually after 1980, reaching $13 million in 1985. Regional and local newspaper publishers and medium-sized commercial printshops are converting from letterpresses to rotary offset presses. The market for sheet-fed offset presses is forecast to approach $18 million, an ample 12.5-percent annual increase. Demand is expected to focus on small-format offset presses (29.5 x 21 cm) for in-plant and commercial printers.

With the trend toward printing more colors in magazines, newspaper supplements, posters, and other items, increased sales are anticipated for multicolor presses designed for high-quality commercial printing. Finally, growing demand is expected for the mechanical or magnetic saddles needed to convert letterpresses for printing with polymer plates.

Bookbinding machinery.—The Swiss printing industry, accustomed to the sophisticated bookbinding equipment produced domestically, presents a good market for efficient, cost-saving, flexible machines. Sales are projected to rise more than 9 percent annually to $28.5 million in 1985. Best sales opportunities include:

- Integrated bookbinding lines
- Fast-working feeders for bookbinding machines
- Collating, folding, saddling, and packaging equipment

The enormous output of today's high-speed presses is forcing printers to invest in ever more efficient paper-handling equipment to relieve the bottleneck between printing and finishing. Many publishing houses are following the international trend toward completely integrated book production lines. In finishing lines, demand is growing for high-per-

Table 2.—Switzerland: Total market and imports from the United States of selected types of graphic industries equipment,[1] 1980 and projected 1985

(in millions of U.S. dollars)

	1980		1985	
	Total market	Imports from U.S.	Total market	Imports from U.S.
Direct entry phototypesetting machines	8.50	.60	12.0	1.0
Tape driven phototypesetting machines				
- without CRT	4.50	.40	8.0	.8
- with CRT	6.00	1.20	15.0	3.0
Keyboard data entry machines[2]	.80	.20	1.5	.5
Video display terminals[2]	.50	.30	1.0	.7
Photocomposition machines for display ads or full page layout	1.20	.40	2.0	1.0
Multistation copy entry systems[2]	1.50	.40	2.5	1.0
Offset platemaking equipment	2.00	.50	3.0	1.0
Process cameras	7.50	.50	12.0	1.0
Lighting systems	3.50	.30	4.5	.5
Color separation scanners	3.50	.50	6.0	1.0
Automatic film processors	4.50	1.70	6.5	5.0
Sheet-fed offset presses	10.00	1.00	18.0	1.8
Web-fed offset presses	8.00	.40	13.0	1.0
Flexographic presses	3.00	.40	5.0	.7
Gravure presses	4.00	—	6.0	—
Quality control equipment[3]	3.00	.80	5.0	1.5
Materials handling equipment[3]	5.00	.50	9.0	.8
Pollution control equipment	3.00	.50	5.0	.8

[1] Values of dedicated computers and related equipment used in phototypesetting and sold in conjunction with phototypesetting machines are included.

[2] Only equipment sold separately

[3] Only equipment specifically destined for the printing industry

Source: See source notation on Table 1.

formance cutting, folding, sorting, and inserting machines to complement the high-speed presses.

Miscellaneous equipment.—Sales of quality-control equipment are expected to grow almost 11 percent yearly to $5 million in 1985, as more instruments are installed to avoid waste and to ensure high quality. The trend is toward continuous on-line controls that immediately check print quality and reduce misprints. Gas chromatographs are used to improve quality, while hygrometers and elaborate air conditioning systems help increase productivity. Continuous ink-controlling devices, such as viscosimeters, are common in large printing shops. Most quality-control instruments are now sold directly to the end users. In the future the industry expects more sales to the original equipment manufacturers.

Propelled by strict regulations, sales of pollution-control equipment are forecast to rise almost 11 percent annually to $5 million in 1985. Offset printing shops use catalytic afterburners to cope with the output of harmful substances in the air. Closed circuits are used effectively to clean polymer residue

Table 3.—Switzerland: Imports of graphic industries equipment by major subcategories and country of origin 1976, 1980, and projected 1985

(in thousands of U.S. dollars)

	1976		1980		1985	
	Import market		Import market		Import market	
	Value	share%	Value	share%	Value	share%
Typemaking and typesetting machinery						
United States	1,502	28.6	4,440	20.3	9,500	26.0
Germany	2,777	52.9	14,065	64.4		
United Kingdom	222	4.2	1,934	8.9		
Italy	224	4.3	575	2.6		
Others	523	10.0	821	3.8		
Total	5,248	100.0	21,835	100.0	36,500	100.0
Photographic equipment for the graphic industries						
United States	1,350	10.0	3,250	12.0	6,000	15.0
Germany	5,400	40.0	10,250	38.0		
Japan	1,100	8.1	2,750	10.2		
Denmark	1,000	7.4	2,250	8.3		
Italy	900	6.7	1,500	5.6		
Others	3,750	27.8	7,000	25.9		
Total	13,500	100.0	27,000	100.0	39,500	100.0
Presses and other printing machinery						
United States	640	6.2	1,960	4.0	3,900	6.0
Germany	7,100	69.0	35,010	71.6		
France	570	5.5	4,200	8.6		
Sweden	240	2.3	2,050	4.2		
United Kingdom	600	5.8	1,660	3.4		
Japan	160	1.6	1,520	3.1		
Others	990	9.6	2,500	5.1		
Total	10,300	100.0	48,900	100.0	65,000	100.0
Bookbinding machinery						
United States	54	2.3	749	8.7	1,400	10.0
Germany	1,808	75.8	6,383	74.4		
Italy	20	.8	412	4.8		
United Kingdom	155	6.5	301	3.5		
Others	349	14.6	732	8.6		
Total	2,386	100.0	8,577	100.0	14,000	100.0
Grand total	31,434		106,312		155,000	
Total imports from U.S.	3,546		10,399		20,800	
U.S. percent share		11.3		9.8		13.4

Source: See source notation on Table 1.

from waste water. Special attention is paid to recycling silver in photochemical processes, both to cut costs and protect the environment. The use of silverless plates is growing. Government regulations require mist-control devices and noise and vibration suppression equipment for worker safety.

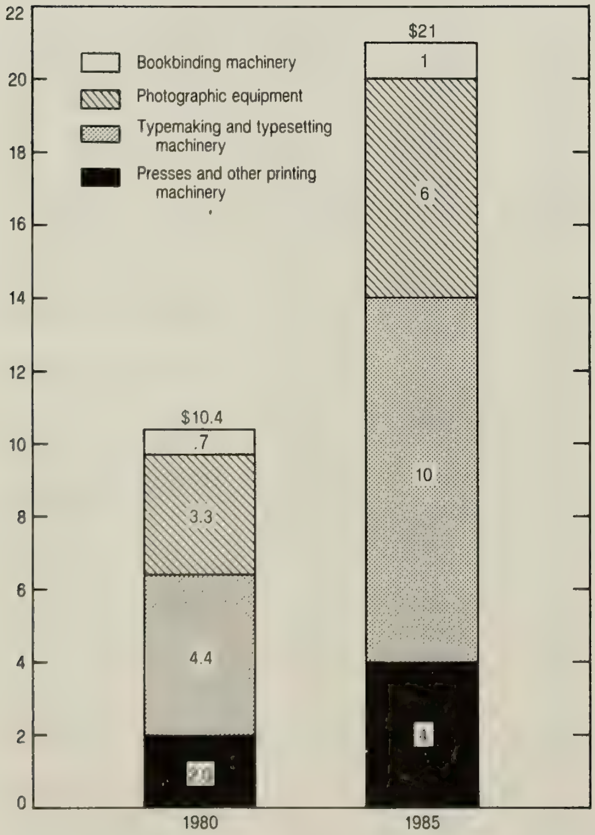
Competitive Environment

Local manufacturers of graphic industries equipment anticipate a 1985 production level of $392.5 million, representing an average annual growth of almost 9 percent from 1980. Enjoying an outstanding reputation all over the world, Swiss firms produce mainly for export, leaving over 75 percent of the domestic market to be satisfied by imports.

German firms are the most important foreign suppliers (see table 3), claiming a preponderant share of imports of typemaking and typesetting machinery (64 percent), presses (72 percent), and bookbinding machinery (74 percent). German manufacturers also lead foreign suppliers in sales of photographic equipment (38 percent of imports) but are beginning to feel competition in this area from American and Japanese suppliers, who claimed 12 and 10 percent of imports, respectively, in 1980.

Figure 2.—Switzerland: U.S. sales of graphic industries equipment 1980 and 1985

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research study.

U.S. position.—American vendors can expect shipments to Swiss buyers to increase steadily to $21 million in 1985 (see figure 2). U.S. products are becoming more competitive because of the growing need to connect more direct entry phototypesetting units and peripheral units to editing/typesetting systems and to integrate more electronic controls into photographic and pressroom equipment, fields in which U.S. technology is highly regarded. Sales are forecast to rise to over 13 percent of imports in 1985, up from 9.8 percent in 1980, even though U.S. subsidiaries in West Europe have intensified production and marketing efforts, narrowing the sales potential for direct shipments from the United States.

Sales of U.S.-made **typemaking and typesetting machinery** are expected to rise by a brisk 16 percent yearly to $9.5 million in 1985. Since modern typesetting is oriented around electronic data processing, a factor favoring technologically sophisticated U.S. suppliers, trade sources expect U.S. firms to claim 26 percent of prepress imports in 1985, after having dropped to 20 percent in 1980. Sales prospects are good for a wide variety of products, including:

Direct entry typesetting equipment
Magnetic data carrier typesetting machines with CRT's
Optical readers
Laser optical character recognition (OCR) equipment
Visual display terminals
Keyboard data entry devices with editing capabilities
Memories for phototypesetting equipment
Software programs for phototypesetting
Full-page photocomposition systems

Direct entry phototypesetting machines are particularly attractive to the medium-sized Swiss printers, who are more interested in high quality than in high speed. U.S. companies are expected to slightly increase their share of this growing market, forecast to exceed $12 million by 1985, due to the quality of their products and their intensified marketing efforts.

Sales of technologically superior American-made phototypesetting machines with CRT's are projected to increase by a dramatic 20 percent annually to $3 million in 1985. The acquisition of Bobst Graphic by Autologic improved the already strong U.S. competitive position. Swiss printers prefer efficient and reasonably priced medium-performance CRT units, with a capacity of 1 million to 5 million characters per hour. Typesetting machines without CRT's are still very attractive to book publishers, commercial printers, and other buyers concerned more with economy than speed. Due to product innovation and support services, sales of American-made items are projected to rise almost 15 percent yearly. Demand is growing for keyboard data entry machines that can store data on floppy disks, cartridges, or magnetic tapes. Mobile entry units transmitting the input via modems are not yet widely used but are expected to be ordered increasingly in coming years. American firms are favored by economies of scale and can expect to claim a third of the imports in 1985.

U.S. vendors of video display terminals (VDT's), currently claiming 60 percent of the import market, can anticipate raising their market share to 70 percent in 1985. Increasingly sophisticated VDT's are sold mostly as parts of larger systems. Newspaper and magazine editors, who formerly objected to them, now consider terminals as prestigious working tools.

Full-page photocomposition machines are not presently considered economically feasible for many users, but are expected to be introduced in the near future. Sales by U.S. companies, which have already developed the necessary software, are projected to rise by more than 20 percent yearly to $1 million in 1985.

Introduction of multistation copy entry systems has been slower in Switzerland than in the United States, but some important establishments have adopted these systems to increase productivity. As technological leaders in the field, U.S. companies expect annual sales increases of over 20 percent, giving them 40 percent of imports in 1985.

American manufacturers are projected to claim a third of the imports of offset platemaking equipment with sales totaling $1 million in 1985. Direct preparation of plates without wet photochemical techniques is not yet widespread but is forecast to expand greatly in the mid 1980's. U.S.-owned companies manufacturing plates in West Europe (Polychrome in Germany and Howson Algraphy in the Netherlands) play a dominant role in this market. They import most of their hardware from the United States, ensuring a good American market share in the future.

Among the important U.S. suppliers of phototypesetting systems and software are AM Varityper, Atex, Autologic, Bedford Computer, Compugraphic, and Harris. Itek's phototypesetting systems are sold through a Swiss company, and Linotype serves the market mainly via subsidiaries in Germany and the United Kingdom. Napp and Polychrome offer polymer plates and platemaking equipment, with 3M (Minnesota Mining and Manufacturing Company) also supplying high-quality offset platemaking equipment. Raytheon is known for sophisticated VDT's. ECRM enjoys a virtual monopoly in laser-based optical readers.

Sales of U.S.-made **photographic equipment** are projected to reach $6 million in 1985, a 1980-85 average annual increase of 13 percent. Industry sources expect American firms to claim 15 percent of imports, up from the current 12-percent share. Market potential is good for developing machines (in particular for continuous films) and rapid access and daylight photographic equipment.

The growing market for automatic film processors encompasses both relatively simple table models and sophisticated on-line equipment. American-made items, considered to represent the state of the art, are expected to do well in both segments, capturing 77 percent of projected 1985 imports. Sales should increase by 24 percent a year to $5 million in 1985.

The major U.S. vendors of photographic equipment active in Switzerland include:Itek (fully automated process cameras including units with integrated developing equipment and cameras for the production of offset printing plates), Kodak (developing machines and films), Logetronics (process cameras and developing machines), 3M (daylight cameras), and Pako (developing machines). Pako's products are partly produced in Ireland and marketed exclusively by Agfa-Gevaert.

Substantial sales of U.S. **presses and other printing machinery** are forecast, as American firms benefit particularly from the growing demand for small offset systems. Shipments are projected to grow by almost 15 percent annually, reaching $3.9 million in 1985. Products with good sales potential include:

- Small-format sheet-fed offset presses (two and more color types)
- Small web-fed rotary offset presses
- Hardware to retrofit letterpresses for the use of polymer plates
- Ultraviolet drying equipment for offset presses
- Flexographic presses
- Special printing presses for labels or for the printing of bar codes

U.S. suppliers of sheet-fed offset presses, who have the advantage of offering complete systems composed of prepress and printing equipment, anticipate 1985 sales of $1.8 million. U.S. vendors also expect a growing market for the increasingly popular mini-webs, boosting sales of web-fed offset presses a dramatic 20 percent yearly to $1 million in 1985.

The market for flexographic presses is increasing with the steadily rising demand for printed packaging materials, but this market sector is fragmented since special techniques and machines are needed for specific jobs. U.S. manufacturers of specialized machines for the printing of multicolor plastic bags and corrugated paper expect their sales of flexographic presses to grow almost 12 percent annually.

Leading American suppliers of offset presses include A.B. Dick, AM International, Harris (whose web-fed offset presses are made in France), Itek, and MGD Graphic Systems Rockwell International (web-fed presses mainly produced in the United Kingdom). Dahlgren has a good reputation for dampening and dilitho equipment.

Bookbinding and finishing equipment of U.S. origin is sold in small but rising numbers in Switzerland. Shipments are projected to rise more than 13 percent annually to $1.4 million in 1985, with good sales prospects for high-speed collating equipment and high-performance finishing machines for business forms.

Growing demand for **other equipment** is expected to generate increased shipments of U.S. products, with sales of quality control instruments rising 13 percent annually, and consumption of American-made materials handling equipment and pollution-control devices climbing 10 percent a year. Sales prospects are best for:

- Envelope and sheet feeders for fast-working presses
- Densitometers
- Vibrometers
- Hygrometers
- Gas chromatographs
- Process-type pH meters

Among American manufacturers, Macbeth has made inroads in the densitometer market, selling through its Swiss subsidiary Kollmorgen. Fife sells printing press controls to diminish waste and improve quality.

Critical Swiss buyers, who are used to high-quality machinery, generally praise American-made equipment for its top performance and efficiency. For certain items, such as computer-based phototypesetting systems, high-speed CRT units, and film developing machines, U.S. technology is regarded as paramount. Overall, American sales could be increased by paying attention to the following factors:

- Manufacturers must be flexible in responding to customers' equipment specifications;
- Product literature must be offered in both German and French;
- Electrical equipment must comply with Swiss standards;

Machinery should be shipped to Europe without electrical equipment, leaving the Swiss importer to add the necessary electrical gear.

Extended and competent presales and aftersales engineering service is a necessity when marketing innovative equipment. Furthermore, the customer expects vendor assistance in training his staff to use the new equipment.

Other foreign suppliers.—German firms, benefiting from their close traditional ties with Swiss customers, as well as their proximity and the common German language, are the dominant foreign suppliers of graphic industries equipment. The two national markets are seen almost as one marketplace by many German firms, including Berthold, Mergenthaler Linotype (a U.S. subsidiary), and Dr. Hell (Siemens), who supply phototypesetting equipment; Klimsch and Hoh & Hahne Hohlux, who dominate imports of process cameras; and Sixt, photographic equipment manufacturer. Major vendors of presses include Albert Frankenthal, Heidelberger Drucksmaschinen, Konig & Bauer, MAN-Roland, and Miller Johannisberg. AM International (a U.S. subsidiary) provides collators and mailers, Kolbus supplies bookbinding equipment, and Stahl furnishes folding machines.

In addition to supplying high-quality products, German firms guarantee servicing and availability of spare parts for 10-15 years after an item is no longer produced, an attractive factor to Swiss managers, who are interested in long service life for their equipment. Mergenthaler Linotype assures its customers that almost all its newly developed equipment is compatible with its former systems.

German manufacturers cement their relationship with Swiss buyers by donating equipment to vocational schools, often very expensive machinery such as electronic scanners. In addition, the Swiss printing industry participates in the findings of the FOGRA research association for printing techniques, which is located in Germany and financed by German, Swiss, and Austrian sources.

French companies have built up a strong position mainly in Western Switzerland, where French is spoken. Vendors such as Chambon, Creusot-Loire, and Marinoni (a subsidiary of Harris, United States) supply almost 9 percent of press imports, concentrating on sales of heavy presses. They benefit a great deal from the loyalty of old customers, who continue to buy French machinery.

Suppliers from the United Kingdom furnished 9 percent of the imported typesetting equipment in 1980. British firms, which previously enjoyed a good reputation for hot-metal typesetting equipment, are now appreciated for their medium- and low-speed phototypesetting machines, found to be both technically and price competitive. British companies have also benefited from the conversion to metrication. Well-known U.K. suppliers of typesetting machinery include Linotype Paul (a subsidiary of the U.S. firm making phototypesetting equipment), Monotype (hot-metal and laser typesetting machines), Xenotron (terminals and photocomposition machines), Ferranti (computers and peripherals), and Grace Letterflex (platemaking equipment). Other major British vendors include Crosfield Electronics, an important supplier of electronic scanners, and two offset press manufacturers—Gestetner and a U.K. subsidiary of MGD Graphic Systems Rockwell International, a U.S. firm.

Italian suppliers, whose products are known for their favorable price/performance ratios, have a small but active role in most segments of the graphic industries equipment market. They have a slight advantage in the small part of Switzerland where Italian is spoken. Photographic equipment is furnished by Durst, and printing presses are supplied by Nebiolo and Cerutti, the latter an Italian-Swiss company with its manufacturing plants in Italy and its commercial headquarters in Switzerland.

Swedish companies such as GMA (Bofors)-Nohab and Solna are relatively important suppliers of printing presses (4 percent of imports), mainly high-performance web-fed rotary offset machines. They also furnish advanced related controls that are marketed as separate units. Danish manufacturers are appreciated for their cost-efficient photographic equipment, claiming over 8 percent of imports. Eskofot ranks as one of the dominant suppliers of compact process cameras, Hope Computer provides film and plate developing machines, and Hans Luth furnishes developing machines.

Japanese firms are making Switzerland one of the first European targets for their printing equipment. In an aggressive sales campaign they have established business relations with well-known Swiss trading houses, offering attractive terms to their business partners and giving good product support. Special advertising budgets are granted to introduce new brands or types of equipment. Offset presses are offered by a number of Japanese firms, including Fuji, Hamada, Komori, Ryobi, and TKS Tokyo Kikai Seisakusho, which also sells letterpresses. Japanese brands of small offset presses are now the market leaders in Switzerland. Japanese vendors also claim over 10 percent of photographic equipment imports. Major suppliers include Dainippon Screen (proof presses, process cameras, and scanners) and Kimoto (film developing machines).

Rounding out the list of foreign suppliers are Israel, whose Sci-Tex firm is a major vendor of color separation scanners, and the U.S.S.R., which successfully sells reliable, low-priced printing equipment. Three Dutch subsidiaries of U.S. manufacturers also supply the Swiss market: Chemco (offset platemaking equipment), ECRM (OCR readers), and Howson Algraphy (developing machines).

Domestic suppliers.—About 50 companies, employing some 5,000 people, produce the world-renowned Swiss-made graphic industries equipment. Production in 1980 was nearly $256 million, with three firms (Bobst, Muller-Martini, and Wifag) accounting for half of total output. The export-oriented Swiss industry focuses on the manufacture of specialized high-performance equipment, particularly advanced phototypesetting equipment, a variety of high-speed presses, high-performance bookbinding equipment, and specialized quality control instruments and materials handling equipment. Swiss machinemakers with their skilled engineers and workers traditionally produce customized machinery to meet the needs of individual users.

Over 90 percent of Swiss-made presses are exported. Major manufacturers include Bobst, Muller-Martini, Wifag, Polytype (a subsidiary of Wifag), and Color Metal. Other well-known vendors include Gallus-Ruesch (label printing equipment) Joh. Gietz (foil-stamping machines), and Moser Lyss (gravure and flexographic presses).

Muller-Martini, Hunkeler AG., and Plastograph make bookbinding machinery, 91 percent of it going to the export market. Gretag is a major producer of densitometers, with Engler & Cie. also supplying quality control equipment. Ferag and von Roll are well-known manufacturers of materials handling equipment.

Swiss manufacturers have acquired the latest techniques in CRT phototypesetting. Ironically, this has led to foreign company takeover of two leading suppliers of phototypesetting equipment. Bobst Graphic now belongs to Autologic (United States) and plans to enter the middle and lower end of the Swiss market for CRT equipment. Guttinger has become a subsidiary of Berthold (Germany), playing an important role at the lower end of the market and intending to gain access to the market for large and medium-sized systems. FAG, a major producer of proof presses, was also taken over by Autologic. Despite these recent acquisitions, foreign-owned companies and licensees are not very significant in Switzerland. Swiss companies themselves have bought foreign companies or established foreign manufacturing subsidiaries, mainly in Germany. Muller-Martini, for example, has acquired the German company Grapha Maschinenfabrik.

Swiss manufacturers invest heavily in research and development activities in order to survive on the world market. Estimates place R&D expenditures at 5 percent of total sales. In addition to in-house research activities, manufacturers benefit from research and test programs by the EMPA Institute (the Federal Materials Testing and Research Institute), which is financed jointly by Government and industry. The IFRA Institute (International Research Association for Newspaper Technology) also passes on the results of its tests and research on newspaper printing technology.

Domestic equipment manufacturers have some advantages over foreign suppliers, notably Switzerland's low inflation rate and highly qualified workers, which translate into a price advantage on high-performance machinery. Customs duties, which are based on weight, give domestic manufacturers an advantage on large machinery, but in general, Switzerland's liberal trade policy discriminates very little against foreign suppliers. Domestic manufacturers have disadvantages on the world market—the very strong Swiss currency and high labor costs make it difficult to sell Swiss machinery during worldwide recession and foreign currency shortages.

Domestic equipment makers are well aware of the mentality of their customers and give importance to psychological factors in building sales. Gretag, a leading supplier of densitometers, recently announced discontinued production of certain types of its products and limited availability of their spare parts. But at the same time Gretag offered to replace the outdated equipment with new instruments at very favorable terms, reducing its short-term profits, but building up its long-term image as a reliable partner of the printing industry.

The Printing Industry

Swiss per capita consumption of printed matter, already among the highest in the world, is expected to grow steadily. Sales of printed products are projected to increase almost 8 percent yearly to $3.2 billion in 1985 (see table 4), well above the 2-percent

Table 4.—Switzerland: Sales, number of firms, and number of employees of the printing industry, by type of product 1976, 1980, and projected 1985

	Sales ($ millions)			Number of firms			Number of employees		
	1976	1980	1985	1976	1980	1985	1976	1980	1985
Newspapers	277	395	560	50	45	40	7,300	6,100	5,400
Magazines	174	265	400	20	20	20	4,900	4,000	3,600
Books	150	200	290	50	50	50	4,700	4,100	3,900
Commercial printing	340	450	640	1,100	1,000	910	12,900	10,800	10,600
Manifold or continuous business forms printing	253	340	480	330	350	300	8,000	6,700	6,500
Printing for packaging	182	265	400	70	80	80	6,200	5,600	5,500
Service industries for the printing trade	158	230	350	400	400	400	6,200	5,900	5,800
Other printing	46	55	80	80	55	50	1,800	1,800	1,700
Total	1,580	2,200	3,200	2,100	2,000	1,850	52,000	45,000	43,000

Source: See source notation on Table 1.

yearly growth predicted for the Swiss gross national product. This is partially due to increased leisure time and higher standards of education enjoyed by the citizens and by immigrant workers residing in Switzerland, which generate increased consumption of magazines and books, particularly paperbacks. Consumption of printed products thus far has not been threatened by the electronic media. Swiss citizens, traditionally heavily engaged in local politics, find that electronic media cannot give them the detailed news they are used to getting from regional and local newspapers.

Switzerland is a net importer of printed products, mainly because of the large demand by its multilingual population for German and French publications. Imports of printed products in 1980 totaled $402 million, with exports of $270 million but the domestic printing industry is trying to improve its foreign trade balance. Fifty leading printers have joined the Swissgraphic group to promote exports, and local sources note that exports are growing at a faster rate (14.4 percent) than imports (11.4 percent).

Advertising expenditures, which increased 3 percent in constant prices in 1980, are expected to continue growing. Newspapers and magazines received 88 percent of total advertising expenditures in 1980, with the remainder going to television. (Swiss radio has no advertising.)Daily newspapers rely on advertising for 80 percent of their revenues, while weeklies and magazines earn half their total income from advertising. Direct mail advertising is gaining importance. Expertly produced catalogues, either mailed directly to consumers or inserted into periodicals, are proving an efficient marketing tool in the retail business.

Almost half the employees in the Swiss printing industry are skilled craftsmen who have completed 3 to 4 years of training. Specialized vocational schools and schools for the training of printing engineers exist, but the number of students interested in printing trades is decreasing. To counter this, the industry launched advertising campaigns to attract bright young people. The result has been a marked increase in enrollment of women apprentices in vocational training for typesetting. Many managers, anxious about the decline in the number of qualified typesetters and printing specialists, are investing in typesetting and printing equipment that can be operated by semiskilled personnel.

Wages are high in the printing industry, totaling 47.5 percent of sales. The average 42-hour workweek is also higher than in neighboring countries. Swiss trade unions are less militant than other European trade unions and accept new technology to raise productivity.

Swiss printers have used quality-control instruments extensively and expect their use to increase to maintain quality of color prints and cut production costs. In large rotary printing plants many quality-control instruments are used on-line in closed loop circuits. Specially designed materials handling equipment is used increasingly to feed today's high-speed presses and to deal with their enormous output. Automated web changing equipment that permits uninterrupted printing has been installed in growing numbers recently. Integrated collating, folding, and bundling/stacking lines are also becoming more common. Split handling lines, with two or more lines connected to one press, are also being installed to cope with high-speed printing output.

All the necessary materials are sufficiently available in Switzerland, but the printing industry is troubled by soaring costs of some items, particularly paper, photochemicals, and inks. Efforts to save paper, ink, film, and other materials are expected to lead to the purchase of more expensive hardware.

The Government has no programs to promote the domestic printing industry. On the negative side, clean-air regulations have become more stringent in recent years, with particular attention paid to air pollution caused by offset machines.

Newspaper printing.—Swiss readers enjoy a large variety and high per capita consumption of newspapers and periodicals, and production is growing. Circulation of daily newspapers is expected to climb from 2.5 million in 1980 to 2.8 million in 1985, with weeklies' circulation increasing from 3.1 million to 3.5 million (see table 5).

Newspaper companies are major buyers of printing equipment, accounting for 17 percent of graphic machinery purchases in 1980 (see table 6). Expenditures for new equipment are expected to grow 10 percent annually, to $37 million in 1985, as newspaper publishers try to meet the demand for advanced typesetting, printing, and handling/dispatching equipment.

This demand is largely influenced by the structure of the newspaper publishing industry, which by American standards has no really large newspapers. The largest has a circulation of 300,000 copies, while well-known papers such as the Neue Zurcher Zeitung and the Berner Bund have circulations of 100,000 and 60,000 copies, respectively. Many of the medium-sized and small newspapers now expect to switch from letterpress to offset rotary presses (see table 7).

Daily papers are adding more color to their copies, and several medium-sized newspaper printshops intend to acquire four-color rotary offset presses to meet this trend. Publishers are also expected to purchase phototypesetting equipment with special peripherals and software, process cameras, developing machines, offset platemaking equipment, special saddles to use polymer plates on letterpresses, and inserting, collating, folding, and bundling equipment. Mailing equipment is needed since most Swiss newspapers are mailed to subscribers.

Table 5.—Switzerland: Production of the book, newspaper, and magazine printing industry by type of publication, number of titles, and circulation, 1980 and 1985

	Number of titles printed 1980	Number of titles printed 1985	Circulation (in millions) 1980	Circulation (in millions) 1985
Books				
Hardbound	7,800	9,000	15	16[2]
Paperbound	1,200	2,000	9	12[2]
Newspapers[1]				
Dailies	129	110	2.5	2.8
2-4 times/week	101	90	.9	1.0
Weeklies	211	200	3.1	3.5
Magazines				
Picture magazines				
Weeklies	27	30	3.3	3.5
Biweeklies and monthlies	48	50	5.5	6.0
Specialist trade and technical papers	1,100	1,050	11.5	11.0

[1] Includes advertising leaflets and gazettes.

[2] Copies/year.

Source: See source notation on Table 1.

Magazine printing.—Approximately 20 printshops are engaged primarily in magazine printing (see table 8), half of them large plants employing more than 100 people, and half of medium size, with 10-99 workers. Because of the small domestic market neither picture magazines nor trade papers have very large production runs. The largest family magazine has a circulation of one million copies a month; most picture magazines sell about 300,000 copies per month. The average circulation for trade papers, which suffer from competition with publications in neighboring countries, is only 10,000 copies.

Even though production runs are small, magazine printers are interested in machinery capable of producing high-quality products. Expenditures for new graphics equipment are projected to grow by a healthy 9.7 percent a year between 1980 and 1985, reaching $19 million in 1985. Demand is expected for quality work multicolor offset and gravure presses, and a good market is anticipated for top performance direct entry units, as well as magnetic carrier driven machines with and without CRT's.

Photographic equipment is of special importance in this sector, with magazine printers interested in electronically controlled process cameras and electronic scanners. Other items expected to be in demand include automated continuous collating and folding lines, bundlers and shrinking tunnels to package magazines in plastic foils, and inserters.

Book printing.—Some 50 firms with 1980 employment of 4,100 people print books in Switzerland. The number of hardbound books printed is expected to increase only slightly to 16 million copies in 1985 while paperbacks, although comprising fewer titles, are projected to increase by a third to 12 million copies.

With a small domestic market and high production costs, book publishing and printing is difficult in Switzerland. Publishing houses tend to print relatively small runs of first editions and to electronically store typeset texts for subsequent editions.

New investments in equipment, forecast at $14 million in 1985, are expected to focus on flexible typesetting equipment, storage units, VDT's with editing and storing capacities that play an important role in the production of complicated scientific books, and relatively small web-fed or sheet-fed offset presses. Since customers require very high quality typesetting, many smaller book printers prefer relatively slow direct entry units that guarantee the best typeface.

Bookfinishing and bookbinding operations are a specific problem due to high labor costs. To combat this, large book publishers have reportedly installed integrated printing and binding lines. Despite the high cost of such systems, their use is expected to increase.

Commercial printing.—Half of Switzerland's

Table 6.—Switzerland: Total capital expenditures and expenditures for graphic industries equipment, by major user sectors 1980 and projected 1985

(in millions of U.S. dollars)

	1980			1985		
	Total capital expenditures	Expenditures for graphic industries equipment		Total capital expenditures	Expenditures for graphic industries equipment	
		Value	%		Value	%
Newspaper printing	44.0	23.0	17.0	75	37	18
Magazine printing	23.0	12.0	8.5	40	19	9
Book printing	19.0	10.0	7.0	29	14	7
Commercial printing	39.0	25.0	18.5	60	37	18
Business forms printing	31.0	22.0	16.0	60	31	15
Printing for packaging	35.0	13.0	9.5	55	21	10
Government printing	11.0	5.0	4.0	18	6	3
Service industries for the printing trade	14.0	8.0	6.0	30	14	7
In-plant printing	24.0	14.0	10.5	40	21	10
Other publishing and printing	10.0	4.6	3.0	13	6	3
Total	250.0	136.6	100.0	420	206	100

Source: See source notation on Table 1.

printing establishments are commercial printers, whose 1985 sales are projected to total $640 million. Over 950 of the 1,000 commercial printshops are small or medium-sized operations, yet together they employ 10,800 people.

Commercial printers face growing competition on several fronts. Plants mainly engaged in newspaper and magazine printing are beginning to do commercial printing in order to fully utilize their production capacity. The growing number of in-plant and government-owned printing shops also presents competition. Finally, the increasing use of inexpensive dry copiers impedes sales.

Still, commercial printers expect to modernize, with investments in new graphic equipment increasing over 8 percent yearly to a 1985 level of $37 million. Trade sources predict growing demand from the small and medium-sized commercial printers for direct entry and magnetic carrier driven typesetting machines, for low-cost compact process cameras, and for small low-priced offset presses, both web-fed and sheet-fed. Commercial printing also involves a multitude of afterpress operations (cutting, folding, sorting, inserting) and requires versatile equipment since customers request many formats and folding patterns.

Business forms printing.—Most of the 350 firms in the business forms printing sector are small; over 70 percent of them employ fewer than 10 people. These firms, faced with increasing demand for business forms, anticipate spending $31 million for new graphic equipment in 1985, a 7-percent average annual increase over 1980 investments.

Business form printers expect to do more specialized work. Carbonless copying sets enjoy widespread demand and have replaced the conventional use of carbon paper in most Swiss offices. Financial institutions are using more business forms for the remittance of funds, a growing share of them OCR readable. In general, electronic data processing is expected to increase the demand for business forms of all kinds.

The sector is already well equipped with standard machines, mainly single or multicolor sheet-fed offset presses. Future demand is anticipated for special equipment for printing labels, carbonless sets, and OCR-readable vouchers, and for conventional equipment for the printing of letterheads, sales and order books, and the like.

Printing for packaging.—Purchases of new graphics equipment by printers of packaging materials are projected to reach $21 million in 1985, a dynamic 10-percent yearly rise between 1980 and 1985, as the sector responds to increased quantity and quality demands.

The growth of convenience foods generates a market for more complex packaging. More packages will have to carry the production or expiration date and the European Article Number of the packaged food products. Affluent Swiss consumers want quality printing as well as attractive packaging materials. Multicolor printing of paper, plastic, and aluminum foils is gaining ground. Sales potential in this sector is especially good for web-fed multicolor offset presses, gravure presses, and flexographic equipment.

Government printing.—New graphic industries equipment expenditures by government printshops are projected to reach $6 million in 1985, a 1980-85 annual increase of 4 percent, mainly for converting from letterpress to offset printing. The Government operates two large full-fledged printing plants, one for the Federal administration and one for the Swiss

Table 7.—Switzerland: Type of printing process as percentage of total dollar volume of printing, by end-user sector 1980 and projected 1985

	Letterpress		Offset-Lithography		Gravure and Screen		
	1980	1985	1980	1985	1980	1985	Total
Newspaper printing	80-90	70-80	10-15	20-25	0-5	5-10	100
Magazine printing	40-50	30-40	30-40	40-50	20-30	20-30	100
Book printing	40-50	30-40	35-40	40-50	10-15	10-15	100
Commercial printing	20-30	20-30	50-60	50-60	5-10	5-10	100
Manifold or continuous business forms printing	50-60	40-50	30- 5	40-50	5-10	5-10	100
Printing for packaging	30-40	25-30	40-50	55-65	10-20	15-25	100
Government printing	30-40	25-35	40-50	55-65	10-20	10-20	100
Service industries for the printing trade	NA	NA	NA	NA	NA	NA	NA
In-plant printing	20-30	25-35	55-65	60-70	5-10	5-10	100
Other printing	20-30	20-30	50-60	50-60	20-25	20-25	100

Source: See source notation on Table 1.

Postal-Telegraph-Telephone system. The other 98 government plants, including those of the individual cantons (Federal States), are mostly small in-house shops using relatively simple machines. Sector demand is expected for lower priced, small format sheet-fed or web-fed offset printing systems (including photographic and platemaking equipment).

In-plant printing.—The availability of low-cost easy-to-operate offset presses and related equipment is inducing many companies to upgrade their office copying/duplicating equipment into in-plant printshops. Many of the in-plant shops are also equipped with collating, sorting, and simple bookbinding equipment, particularly mechanical (spiral) binding machines.

Investments in new graphic equipment are forecast to rise at over 8 percent a year to a 1985 level of $21 million. Most companies prefer to buy complete systems (direct typesetting machines, daylight cameras, platemaking equipment, printing press, and sorter) from one supplier that also sells plates and photographic materials. Modular design of the system components is appreciated by customers as it permits step-by-step expansion of the plant.

Service industries for the printing trade.—Sales of services to the printing trade are predicted to reach $350 million in 1985, growing rapidly at 9 percent annually. The sector is gaining ground because many of the small and medium-sized shops that make up the Swiss printing industry cannot afford expensive computerized equipment and software, and contract for typesetting, in particular, to specialized service shops. Even large printers use service shops to cope with peak workloads.

Switzerland's 400 service shops plan extensive capital investments since only shops with the latest equipment can survive competitively. New graphics equipment expenditures are projected to reach $14 million in 1985, climbing dramatically at 12 percent a year. Demand is expected for direct entry phototypesetting equipment and magnetic carrier-driven units with and without CRT's. Service shops increasingly acquire photographic equipment to widen the range of services they offer. Electronic scanners and process cameras are of particular interest because many printers want to use these techniques but cannot afford the equipment themselves.

Table 8.—Switzerland: Number of firms by size [1] in the printing industry sectors, 1980

	Number of firms			
	Large	Medium	Small	Total
Newspaper printing	20	20	5	45
Magazine printing	10	10	—	20
Book printing	15	25	10	50
Commercial printing	35	550	415	1,000
Manifold or continuous business forms printing	10	90	250	350
Printing for packaging	5	35	40	80
Government printing	2	20	78	100
Service industries for the printing trade	—	200	200	400
In-plant printing	—	100	200	300
Other printing	—	25	30	55
Total	97	1,075	1,228	2,400

[1] Size is defined by number of employees: large, more than 100; medium, 10 to 99; small, fewer than 10.

Source: See source notation on Table 1.

Additional Information

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Country Market Survey

Computers and Peripheral Equipment

Italy

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

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International Trade Administration

Italy's current economic woes have dampened expansion in today's market for computers and related equipment, but trade sources foresee rapid growth in the years ahead. From a 1980 level of $1.47 billion[1] (up only 5 percent over 1979 totals), sales are forecast to rise to nearly $2.9 billion in 1986, with most of the growth expected to come after 1982 (see table 1). Tremendous latent demand is said to exist, since computer use hasn't begun to approach saturation in any sector. Many Italian managers are counting on automation to help them overcome spiraling labor costs and the constraints of tight credit. Thousands of small to medium-sized businesses are potential first-time buyers of electronic data processing (EDP) hardware in Italy, while large companies that already employ computers are expected to upgrade their central facilities and add equipment at branch locations. American vendors, who supply some 20 percent of the total market with U.S.-source shipments, also operate local manufacturing plants and sell to Italy from European subsidiaries. By 1986, direct U.S. sales are projected to approach $570 million (see table 2).

The rapid technological change that has dramatically improved price/performance ratios of computer hardware underlies the development of the Italian market. Demand for minicomputers is shaped by their improved processing power and suitability to a wide range of applications. They can be programmed to control complex industrial processes or, thanks to packaged software, used off-the-shelf by inexperienced clerical staff to handle business processing. Small establishments in Italy are buying efficient, easy-to-use mini's as their sole computer; large corporations are installing them in widely dispersed branch offices and factories as the basis

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=848.66 lire (1978), 830.86 lire (1979), and 856.45 lire (1980 and subsequent years). Values through 1980 are expressed in current rather than constant dollars: values for 1981 and subsequent years are expressed in 1980 constant dollars.

Table 1.—Italy: The market[1] for computers and peripheral equipment, 1978-81 and 1986

(in millions of U.S. dollars)

	1978	1979	1980	1981	1986
Minicomputers					
Production	237.26	399.71	391.25	438.2	1,100
Imports	70.70	90.15	122.83	137.5	290
Exports	166.14	215.44	198.61	222.4	540
Market size	141.82	274.42	315.47	353.3	850
Small, medium, and large computer systems					
Production	355.15	440.75	423.85	435.5	570
Imports	295.06	335.80	479.77	485.9	680
Exports	79.54	105.93	225.82	230.0	300
Market size	570.67	670.62	677.80	691.4	950
Peripherals (sold separately)[2]					
Production	307.66	433.41	417.10	438.5	950
Imports	77.85	126.29	284.07	297.5	560
Exports	80.18	138.41	268.78	282.0	580
Market size	305.33	421.29	432.39	454.0	930
Data communications equipment (sold separately)[2]					
Production	26.75	33.81	38.53	42.5	105
Imports	8.88	12.91	15.18	16.0	36
Exports	1.45	1.77	2.34	2.5	6
Market size	34.18	44.95	51.37	56.0	135
Totals					
Production	926.82	1,307.68	1,270.73	1,354.7	2,725
Imports	452.49	565.15	901.85	936.9	1,566
Exports	327.31	461.55	695.55	736.9	1,426
Market size	1,052.00	1,411.28	1,477.03	1,554.7	2,865

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Excluding equipment sold as components of integrated computer systems.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Italy" (see Additional Information box). Figures in this report are based on data gathered in Italy, including available government statistics, industry reports, and trade source estimates and projections.

Table 2.—Italy: Imports of computers and peripheral equipment[1] by country of origin, 1979-81 and 1986

	1979		1980		1981		1986	
	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)
Minicomputers								
United States	44.77	49.7	55.58	45.2	63.90	46.5	145.0	50.0
Germany	20.83	23.1	30.66	25.0	33.70	24.5		
France	7.66	8.5	11.42	9.3	12.50	9.1		
United Kingdom	6.31	7.0	7.36	6.0	8.00	5.8		
Japan	2.64	2.9	—	—	—	—		
Other	7.94	8.8	17.81	14.5	19.40	14.1		
Subtotal	90.15	100.0	122.83	100.0	137.50	100.0	290.0	100.0
Small, medium, and large computer systems								
United States	96.61	28.8	129.49	27.0	132.60	27.3	200.0	29.4
Germany	72.02	21.4	110.45	23.0	115.00	23.7		
United Kingdom	58.79	17.5	100.22	20.9	105.00	21.6		
France	62.19	18.5	70.31	14.7	70.50	14.5		
Other	46.19	13.8	69.30	14.4	62.80	12.9		
Subtotal	335.80	100.0	479.77	100.0	485.90	100.0	680.0	100.0
Peripherals (imported separately)[2]								
United States	40.32	31.9	95.77	33.7	101.20	34.0	210.0	37.5
Germany	17.72	14.0	48.28	17.0	53.50	18.0		
France	11.20	8.9	14.71	5.2	14.50	4.9		
United Kingdom	24.90	19.7	48.87	17.2	48.00	16.1		
Japan	.65	0.5	.74	0.3	.90	0.3		
Other	31.50	25.0	75.70	26.6	79.40	26.7		
Subtotal	126.29	100.0	284.07	100.0	297.50	100.0	560.0	100.0
Data communications equipment (imported separately)[2]								
United States	4.52	35.0	5.67	37.4	6.00	37.5	14.5	40.3
Germany	4.59	35.5	5.31	35.0	5.50	34.4		
United Kingdom	1.59	12.3	1.78	11.7	1.90	11.9		
France	1.21	9.4	1.26	8.3	1.30	8.1		
Other	1.00	7.8	1.16	7.6	1.30	8.1		
Subtotal	12.91	100.0	15.18	100.0	16.00	100.0	36.0	100.0
Total imports	565.15		901.85		936.90		1,566.0	
Total imports from U.S.	186.22		286.51		303.70		569.5	
U.S. share of total imports		33.0		31.8		32.4		36.4

[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

[2] Excluding equipment imported as components of integrated computer systems.

Source: See source notation of table 1.

for distributed processing networks. Observers predict 18 percent per annum growth in the market for minicomputers, leading to a fourfold expansion in the mini population from 1980 to 1986 (see table 3).

To take full advantage of the benefits promised by distributed processing, Italy plans to improve its data communications network, and individual users intend to add peripherals suited to their specialized needs. The trend to decentralize computer installations is expected to spur sales of data communications equipment, forecast to grow 17 percent annually to $135 million in 1986, as well as stimulate demand for peripherals to transmit and receive data and messages. The number of terminals per CPU (central processing unit) continues to climb. By 1986, the market for add-on peripherals is projected to reach $930 million.

In 1978, systems based on small, medium, and large computer mainframes made up over half the Italian market for computers and related equipment; by 1986 they are projected to account for only one-third of sales. Small systems, despite competition from minicomputers, are expected to sell well in Italy because of their improved performance and suitability to the needs of numerous medium-sized industrial, commercial, and service companies. Many large firms are also employing small computers in distributed or hierarchical networks. The number of small systems is expected to grow some 70 percent over the 1980-86 period. Big mainframes are also in demand, primarily to monitor and control increasingly complex networks. By 1986, the Italian economy is forecast to have about 700 large systems in operation, up from 430 in 1980. Relatively slow growth is foreseen in sales of medium-sized computers, which many users are passing up for either small or large systems.

Manufacturing.—By far the largest computer users are Italian manufacturers, whose 1980 purchases of $613 million accounted for over 40 percent of the total market (see tables 4 and 5). The manufacturing sector operated nearly 16,000 computers in 1980 and, despite the depressed state of the local economy, plans to step up its purchases some 12 percent yearly to increase efficiency and cut production costs. Demand will come from large industrialists who are upgrading and extending their EDP equipment base and from first-time buyers. Relatively few small to medium-sized manufacturers are automated: a recent survey of 54,000 industrial establishments with 11-250 employees showed that only 18 percent own or lease any EDP hardware.

Banking and finance.—Banking and finance was the first sector to computerize in Italy. By 1980 banks accounted for 16 percent of the country's expenditures on computers and related equipment, spending more per employee ($1,280) than any sector other than EDP service bureaus. As sophisticated users of medium and large computers, banks are highly responsive to the latest technology, and they are forecast to raise their equipment spending 10.5 percent a year over the 1980-86 period.

Table 3.—Italy: Population of computers, by size,[1] 1980 and 1986

	1980		1986	
	Number of units	Percent of total	Number of units	Percent of total
Minicomputers	25,500	69.7	110,000	85.6
Small computers	9,300	25.4	16,000	12.5
Medium computers ..	1,350	3.7	1,800	1.4
Large computers ...	430	1.2	700	0.5
Total	36,580	100.0	128.500	100.0

[1] Computer size is based on similarity to IBM CPU's, as follows: minicomputers, process computers and small business computers equivalent to IBM System/32, System/34, Series 1, excluding microcomputers and personal computers; small computers, equivalent to IBM System/38, System/3; medium computers, equivalent to IBM 4300 Series; and large computers, equivalent to IBM 303X Series, 3081 System.

Source: See source notation of table 1.

Retailing and wholesaling.—Projections show the retail and wholesale sector increasing its expenditures on computers and related equipment over 12 percent per annum from 1980 to 1986, accounting for 13.5 percent of the market by the latter year. Several large companies are devoting as much as 2-3 percent of sales to computer modernization programs. These and other firms expect to buy point-of-sale (POS) terminals, key-to-disk data entry systems, and minicomputer-based small business systems.

Government.—A rapid 14 percent per annum growth in spending to $301 million in 1986 is predicted for the government sector. The government's investment in computers could climb even faster, according to some industry analysts, since wide areas of local and central administration are not yet automated. However, resistance from entrenched bureaucrats, shortage of trained personnel, and lack of a coordinated government EDP policy have impeded computerization in the past. Where automation has been introduced, poorly designed and obsolete systems have sometimes hampered effective use of computer methods.

Government plans at the national level include rationalization of the Ministry of Finance tax information system (which, at the end of 1980, consisted of 5 computers linked via a teleprocessing network to 413 income tax offices, 95 value-added tax offices, and 171 register offices), creation of an information system in the Ministry of Justice, and development of computer installations at the Defense Ministry. Locally, most regional governments have automated a number of administrative functions. Next will come the creation of data banks to assist in regional planning. Computerization is reaching even into the smaller (less than 40,000 population) municipalities, which are quickly adopting minicomputers. The number of mini's used in small town administration jumped about 70 percent in 1980.

Other sectors.—No other sector accounts for as much as 5 percent of Italian expenditures on computers and related equipment, though brisk growth is forecast for several groups of users. The communications sector is expected to step up its purchases at a 17 percent per annum rate as telecommunications networks are modernized and expanded. Ente Nazionale per l'Energia Elettrica (ENEL), the state electric power utility, spearheads spending by the utility sector, which is foreseen rising some 12 percent yearly. Similar growth is expected for equipment expenditures by the publishing and printing sector and by Italy's 269 EDP service bureaus (see table 6).

Major Market Trends

Business and commercial data processing dominates the application of computers in Italy, accounting for 70 percent of minicomputer installations and small computer processing time (see tables 7 and 8). It is also the primary use of medium and large computers. Direct industrial control, though growing in importance for mini's and small computers, accounts for less than 10 percent of medium and large mainframe processing time. However, the small machines are less likely than larger systems to be employed for scientific/engineering problems, in military applications, and at educational institutions.

Trends characterizing Italian computer use are discussed in the following section.

Storage systems.—Italian users store most of their data on disks. Demand for increased capacity is predicted for fixed disks, but even faster growth is foreseen in sales of removable disk storage devices. Small systems and mini's rely heavily on floppy diskettes, and peripheral diskette drives offer a promising market. Magnetic tape storage (reels, cassettes, and cartridges) also continues to grow in popularity as advances allow higher storage density. Among users administering large tape-mounted data banks, automated mass storage systems offer a good potential market. Demand for more exotic add-on memories, such as extended core and external semiconductor memories, is limited by their high cost. Italian users have expressed interest in magnetic core memories, though actual sales containue to lag.

Data input.—Although keypunch input systems are on the decline, their demise has not been total in Italy. Trade sources report that user familiarity with punched card input will mean continuing demand for keypunch equipment from selected user sectors. Faster growth is foreseen in key-to-magnetic-carrier entry devices, particularly key-to-diskette units. Italian data collection systems often employ such input techniques. Data input via direct access to or dialog with a computer memory is increasingly important. Efficient, economical on-line data processing using cathode ray tube (CRT) keyboard terminals is rendering remote batch processing virtually obsolete. Data tablets and graphic input devices, still rare on the Italian market, are thought to offer an expanding market in the future.

Strong demand is predicted for optical reading systems because these devices help hold down labor costs. Initially used in the Italian financial industry, OCR (optical character recognition) and OMR (optical mark recognition) equipment have excellent potential in other sectors ranging from public administration to service industries and manufacturing. Magnetic ink character recognition (MICR) devices, on the other hand, are considered to have limited market prospects.

Table 4.—Italy: Expenditures[1] for computers and peripheral equipment by major user sectors, 1980 and 1986

	1980		1986	
	Value ($ millions)	Percent of total	Value ($ millions)	Percent of total
Government	25.10	1.7	35.0	1.2
Manufacturing	31.00	2.1	51.0	1.8
Banking and finance	17.70	1.2	35.0	1.2
Insurance	62.05	4.2	120.0	4.2
Retailing and wholesaling	44.38	3.0	66.0	2.3
Transportation	140.30	9.5	301.0	10.5
Utilities	613.00	41.5	1,217.0	42.5
Communications	236.30	16.0	429.0	15.0
Health care	41.35	2.8	72.0	2.5
Education and research institutions	193.50	13.1	386.0	13.5
Publishing and printing	26.60	1.8	46.0	1.6
EDP service bureaus	17.70	1.2	35.0	1.2
Other	28.05	1.9	72.0	2.5
Total	1,477.03	100.0	2,865.0	100.0

[1] Excluding costs of software, hardware maintenance, sales commissions, etc.

Source: See source notation of table 1.

Output. — Trade sources say output in CRT displays is increasingly popular, and a booming market is foreseen. Users typically enter data at a CRT-equipped intelligent terminal, view the results of their program on the screen before printing them out, then save the results on disk or diskette. Among hard-copy output devices, high-speed nonimpact printers and teletypewriters are expected to show fastest market expansion. Graphic CRT displays and plotters are of considerable interest to Italian users; demand is expected to grow rapidly as more manufacturers employ computer assisted design (CAD).

Distributed vs. centralized processing. — Many Italian users are convinced that distributed systems offer advantages over centralized processing in a variety of situations. Distributed processing allows decentralization of responsibility, greater protection against downtime on a central mainframe, and the ease of expanding by simply adding another small computer to the network. The trend to distribute

Table 5.—Italy: Cumulative number and value[1] of installed computers,[2] by major user sector, as of December 31, 1980

	Minicomputers		Small computers		Medium computers		Large computers	
	Number of units	Value ($ millions)	Number of units	Value ($ millions)	of units Number	($ millions) Value	of units Number	($ millions) Value
Government	1,100	38	600	120	160	129	60	211
Manufacturing	11,000	385	4,265	852	510	408	155	540
Banking and finance	4,000	140	580	115	160	128	125	438
Insurance	1,000	35	175	35	40	32	15	53
Retailing and wholesaling	3,500	120	2,125	423	120	95	25	87
Transportation	800	30	135	28	35	28	5	18
Utilities	700	25	105	20	25	20	5	18
Communications	500	18	145	30	29	23	6	21
Health care	300	10	160	32	45	36	5	18
Education and research institutions	1,000	35	185	37	75	60	10	35
Publishing and printing	500	17	115	22	26	20	4	13
EDP servce bureaus	600	20	375	74	63	51	12	42
Other	500	17	335	67	62	50	3	11
Total	25,500	890	9,300	1,855	1,350	1,080	430	1,505

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

[2] Computer size is based on similarity to IBM CPU's, as follows: minicomputers, process computers and small business computers equivalent to IBM System/32, System/34, Series 1, excluding microcomputers and personal computers; small computers, equivalent to IBM System/38, System/3; medium computers, equivalent to IBM 4300 Series; and large computers, equivalent to IBM 303X Series, 3081 System.

Source: See source notation of table 1.

processing has only taken hold in Italy over the past 2 or 3 years, and centralized facilities still prevail in many sectors. The growing use of minicomputers equipped with local files and intelligent terminals represents an initial step toward EDP decentralization. Italian manufacturing firms employ mini's at local plants to handle first-cut processing of data from several factory terminals, relieving the host system of some of the heavy workload of managing terminal traffic. However, most networks in use so far are hierarchical systems with a central computer linked to smaller distributed systems, which in turn are connected to individual terminals. Few networks currently in operation offer the linkup and cooperation of computers at the same hierarchical level characteristic of true distributed processing.

Teleprocessing/data communications.—Adoption of teleprocessing in Italy is closely linked with development of the country's data communications facilities. Data communication is controlled by Societa Italiana per l'Esercizio Telefonico (SIP), an agent of the Ministry of Post and Telecommunications responsible for domestic telephone traffic. Service is provided through about 17,700 switched telephone lines, 55,000 leased lines used exclusively for data transmission, 1,324 telegraph lines dedicated to data transmission, and the telex network (with about 40,000 terminals connected). Transmission speeds range from 50 bits per second (bps) on the Telex network to as high as 9,600 bps on some leased lines. Italian users are satisfied with the service offered. Some 260,000 modems are currently in use, and trade analysts expect the figure to top 500,000 by 1986.

In 1980, SIP began constructing a public data communications network capable of transmitting data from one source to a number of users, with the objective of serving about 5,000 users by early 1983. By 1986, SIP hopes to have some 200,000 subscribers for the service. Other facilities will also be expanded. SIP anticipates that some 20,000 terminals will be using the switched telephone network to transmit and receive data at speeds of 2,400 bps and that 100,000 leased lines (including 52,000 digital circuits) will be available.

Other aspects of data transmission under study include Videotel, an information service that operates through home television screens. Currently operating experimentally with 1,000 users, the service could be provided nationwide as early as 1983. The Ministry of Post and Telecommunications is also continuing research on expanding data transmission via satellite and on use of optical fibers to transmit data. Italy's data communications facilities are described in greater detail (service charges, equipment rental rates, etc.) in the original market study on which this Survey is based (see Additional Information box).

Freestanding vs. networked minicomputers.—Most minicomputers used in Italy operate independently in small establishments. However a growing number of larger manufacturing firms, insurance companies, and government organizations are connecting mini's in networks. Some transmit data between different points in the network; others are all linked to a larger central mainframe.

Small business computers.—Demand for small business computers underlies the burgeoning market for mini's. Growing availability of standard software packages makes small business systems equally suitable to the first-time automation of small companies and the decentralization of processing at large multiplant firms. Local users have been well informed about the benefits of small business computers by two market leaders with Italian plants. The Italian manufacturer Olivetti has a long tradition as a supplier of electric and electronic office machines, and has convinced many local firms to switch to computers. Olivetti's recent entry into the market for business-use personal computers could, however, cut into sales of larger mini-based business systems. The local presence of IBM, which builds its System/34 and Series 1 at a factory in Milan, has also helped sell Italian small businessmen on computerization. From some 18,000 units worth $540 million in 1980, industry observers expect the population of small business computers to expand to about 90,000 units valued at $2 billion in 1986.

Automated business transaction information systems.—Italian observers expect the current interest in automated transaction systems to translate into strong demand over the next few years. Large wholesalers are expected to invest heavily in POS terminals. A number of manufacturers have begun monitoring not only the flow of materials and people with badge readers but also factory data collection systems. And Alitalia, the national airline, plans to install a new ticketing system soon.

In the financial sector, large and medium-sized banks have computerized most of their operations. Cash dispensers can now be found in a growing number of Italian bank branches, and medium-term forecasts indicate brisk demand for automatic teller machines capable of normal deposit/withdrawal operations, handling post office transactions, and providing customers with checkbooks. Automated credit transaction systems are said to be widely used, and international funds transfer is carried out electronically using the Society of Worldwide Interbank Financial Telecommunication (SWIFT) system.

Computerized photocomposition systems.—Publishing and printing companies are striving to automate production in hopes of holding down labor and overhead costs. As a result, many printing plants are expected to invest in computerized photocomposition and typesetting equipment over the 1980-86 period. Such systems are also employed by the Italian National Printing Office and may soon be installed by the Central Statistical Institute. The Italian state railway plans to use photocomposition

Table 6.—Italy: Total employment and number of establishments, by size,[1] in major EDP user sectors, 1980

	Total employment	Number of establishments Large	Medium	Small	Total
Government, including education and research institutions	2,362,000	NA	NA	NA	NA
Manufacturing	5,163,000	878	5,828	609,025	615,731
Banking and finance	184,000	33	236	13,067	13,336
Insurance	73,000	12	58	15,844	15,914
Retailing and wholesaling	2,797,000	103	1,589	1,247,529	1,249,221
Transportation	668,000	134	585	100,204	100,923
Utilities	155,000	20	297	8,605	8,922
Communications	227,000	48	308	15,151	15,507
Health care	531,000	302	894	668	1,864
Publishing and printing	139,000	18	154	12,618	12,790
EDP service bureaus	6,000	—	31	238	269

[1] Size of establishment is based on number of employees, as follows. Small retail/wholesale establishments and EDP service bureaus employ less than 50; medium, 50 to 199; and large, more than 199. Small health care establishments have less than 101 beds; medium, 101 to 500; and large, more than 500. For other sectors, small establishments employ less than 100; medium, 100 to 499; and large, more than 499. No criteria could be established for educational and government institutions.

Source: See source notation of table 1.

Table 7.—Italy: Percentage breakdown of total installed minicomputers[1] by end-user applications, 1980

		Percent of total
Business/commercial data processing		70
Industrial control		12
Continuous process control	4.0	
Direct machine control	5.0	
Factory management	2.0	
Other	1.0	
Data communications		8
Terminal controllers	4.0	
Front end systems	1.5	
Message circuit switching	0.5	
Data concentrators	2.0	
Laboratory analysis		5
Medical sciences	2.5	
Other life sciences	0.5	
Physical sciences	2.0	
Other		5
Total		100

[1] Minicomputers are defined as process computers and small business computers equivalent to IBM System/32, System/34, Series 1, excluding microcomputers and personal computers.

Source: See source notation of table 1.

equipment to prepare timetables and platform information posters.

Medical information systems.—Application of computerized medical information systems has been hampered by the health care sector's economic difficulties. Although major investments in computerization must await implementation of reforms in the Italian health care system, leading public hospitals already employ intelligent terminals that query a central computer to carry out administrative tasks. Some institutions use automated medical history or laboratory information systems, and trade sources foresee an enormous potential market for such systems in the future.

Software and data base management systems.—Total software expenditures by Italian computer users in 1981 have been estimated at about $2 billion, including 30 percent spent in-house, 65 percent purchased from hardware manufacturers, and 5 percent bought from independent software houses. Expenditures for applications software, which accounted for only 25 percent of software spending in 1981, is expected to grow dramatically. By 1986, users will spend over half of their projected $7 billion software outlays on applications programs. Independent software houses will also become more important, especially as suppliers of standard packages. Currently popular applications packages include Ascot (tax register) and Memis (inventory management, payroll) from Italsiel (Italy), Siam (general accounting) and Sicura (insurance accounting) from Syntax (Italy), IFS (accounting) from IBM, and GL-Plus (accounting) from Praxix (Italy).

Data base management systems (DBMS) are used at many large-scale computer installations in Government, the financial sector, and insurance companies. IBM's DLI has over 100 users, while IDS 2 (Honeywell), System 2000 (Syntax), and Adabas (Selesta, Germany) each boast about 30. In telecommunications monitoring, IBM's CICS DOS/VS is employed by 600 establishments, followed by Honeywell's TDS, with 50-100 users. IBM and Syntax are the major suppliers of other systems software packages.

EDP personnel.—The surging demand for trained computer professionals far outstrips the current supply, estimated at about 100,000 in official Italian statistics. Operators and programmers each make up 25 percent of the workforce; systems analysts, software designers, and systems engineers account for 22 percent; and EDP managers and other personnel make up the balance. A number of universities have created post-graduate programs for specialized EDP training. Only about 1,500 graduate students are enrolled at present, but the number of such advanced courses is expected to triple by 1986. At the undergraduate level, some 10,000-15,000 students are taking EDP courses. By 1986, trade sources predict, the supply of manpower will range from 150,000-200,000 people.

Systems acquisition.—Italian computer users ordinarily purchase cheaper equipment but lease big-ticket items. Organizations using large-scale systems are more reluctant to tie up capital in equipment that could become obsolete in a few years. About 80 percent of general purpose small, medium, and large computer systems are leased, but purchase prevails for mini's (75 percent of acquisitions) and peripherals (60 percent).

The users of large systems have pioneered multisource acquisition in Italy. A broad range of low-cost peripherals for large systems is now available from a variety of vendors, and a number of consulting firms has sprung up to help users assemble appropriate hardware packages. Increasingly, these consultants also supply turnkey installations complete with software to buyers of small and medium-sized systems. In the public sector, government agencies pursue a deliberate policy of multi-sourcing to encourage a variety of domestic manufacturers of computer and peripherals. Small system buyers prefer to stick with a single vendor because they want attentive individualized service.

Competitive Environment

As local output accelerates over the 1980-86 period, imports are forecast to expand at a slower pace than the total market. Purchases from foreign vendors, most of them American or American-owned, are projected to rise about 10 percent per annum to nearly $1.6 billion in 1986.

U. S. suppliers.—U.S. brand names overwhelmingly dominate the Italian computer scene. IBM, Univac, Honeywell, Burroughs, NCR, and Control Data Corporation (CDC) systems accounted for over 80 percent, by value, of the installed computer population at the end of 1980 (see table 9). U.S. manufacturers supplied 32 percent of imports in 1980 with hardware worth $287 million. American minicomputer vendors are particularly competitive. Having captured 45 percent ($55.6 million) of imports in 1980, U.S.-built mini's are projected to expand their share to 50 percent ($145 million) by 1986. Italian buyers appreciate the technical excellence of American minicomputers, both for scientific and small business applications. Prominent suppliers include Digital Equipment Corporation (DEC), Data General, Hewlett-Packard, Honeywell, Texas Instruments, and NCR. IBM ships most of its mini's to Italian users from local and European plants.

Flexible software and a good price/performance ratio helps U.S. competitors retain their share of the market for small, medium, and large computers. For 1986, American sales are projected at $200 million. In addition to IBM, leading vendors include Burroughs, CDC, General Automation, Hewlett-Packard, NCR, Sperry Univac, and Honeywell.

In the market for peripherals (sold separately), imports from America are forecast to rise a swift 14 percent per annum to $210 million in 1986. U.S.-built magnetic disk memories, floppy disk drives, large tape and disk data storage systems, OCR equipment, CRT terminals, and POS terminals are considered especially salable. American manufacturers can also expect to do well in Italy with data communications equipment, including high-speed modems. Industry analysts project direct shipments from the U.S. for 1986 at $14.5 million, or 40 percent of imports. A recent decision by Italtel, the state-owned telecommunications equipment manufacturer, to form a partnership with America's General Telephone & Electronics to develop an electronic telephone switching system for the Italian market could mean even greater growth for U.S. sales.

Third-country suppliers.—Without ties to one of the multinational computer giants, few suppliers can match the technological edge of American firms. European subsidiaries of U.S. manufacturers account for much of the nearly $1 billion in imports from third-country sources projected for 1986. IBM ships to Italy from factories in Britain and Germany, Univac and Burroughs both have plants in the U.K., and Honeywell supplies the Italian market through its French partner, CII-HB.

Among European-owned rivals to American manufacturers, German vendors are prominent. Both Nixdorf and Siemens provide a broad range of computers, mini's, and terminals. Triumph Adler does well with peripherals and small business computers. A successful competitor from the United Kingdom is ICL, which has sold Italy over $25 million worth of computers. In addition, Holland's Philips is recognized for its business-oriented minicomputers and peripherals, while Sweden's Datasaab succeeds with terminals and small business computers.

Domestic suppliers.—About 10 manufacturers of computers and related equipment operating in Italy employed about 35,000 workers in 1980 to produce hardware worth $1.27 billion. A swift 14 percent per annum expansion in output to $2.7 billion in 1986 is forecast. Two subsidiaries of U.S. firms figure prominently in the local industry. IBM Italia produces a wide range of products (Series 1, System/34, System/38, and numerous peripherals), and Honeywell Information Systems Italia manufactures its DPS 4 computer and several types of printers.

Domestically owned competitors are led by Oli-

Table 8.—Italy: Percentage breakdown of total processing time of installed small, medium, and large computers[1] by end-user application, 1980

	Small computers	Medium computers	Large computers
Business/commercial data processing	70	65	57
Industrial automation/process control	10	8	5
Scientific/engineering applications	5	10	16
Military/aerospace applications	1	2	5
Data communications/teleprocessing	5	5	5
Medical/scientific lab analysis	2	2	3
Education, instruction	2	3	6
Other	5	5	3
Total	100	100	100

[1] Computer size is based on similarity to IBM CPU's, as follows: small computers, equivalent to IBM System/38, System/3; medium computers, equivalent to IBM 4300 Series; and large computers, equivalent to IBM 303X Series, 3081 System.

Source: See source notation of table 1.

Table 9.—Italy: Cumulative number and value[1] of installed computers, by major suppliers, as of December 31, 1980

	Number of units	Value ($ millions)	Share of total value (%)
IBM	13,650	2,980	55.9
Honeywell[2]	5,300	910	17.1
Univac	600	202	3.8
NCR	1,030	157	2.9
Siemens (Germany)	310	155	2.9
Burroughs	1,448	41	0.8
ICL (U.K.)	124	25	0.5
Control Data Corporation	25	17	0.3
Others	14,093	843	15.8
Total	36,580	5,330	100.0

[1] Value is based on original purchase price. Figures include leased equipment counted at its orignal list price as if sold outright.

[2] Includes EDP equipment manufactured by Honeywell's French partner, CII-HB.

Source: See source notation of table 1.

vetti, whose 1980 sales of $1.3 billion included some $500 million in EDP hardware. Olivetti, long specialized in office machinery, also manufactures business computers, data entry systems, terminals, and telecommunications equipment. The firm has ambitious plans to expand production of small-scale systems and terminals suited to distributed processing.

Two other local manufacturers are controlled by the state holding company Istituto per la Ricostruzione Industriali (IRI). Italtel builds modems, multiplexors, and computers for telecommunications control. Selenia, which produces mainly military electronics, also sold minicomputers and terminals worth about $15 million in 1980.

Additional Information

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The Survey summarizes a 101-page International Market Research (IMR) report prepared by Directa S.r.L. in Milan, Italy, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Italy and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
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Sales Desk Telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Computers and Peripheral Equipment in Italy," ITA 82-05-513, November 1981.

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Electric Power Systems

Italy

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

After several years of depressed investment, combined public and private sector spending on power generation equipment is expected to grow from $482 million[1] in 1981 to more than $900 million in 1986 (see table 1). The Government is seeking to expand a number of existing power plants and build several more new ones, and an improving economic climate is allowing industrial end-users to increase their expenditures on electric power systems. Motor generator sets, energy-efficient lighting systems, and components relating to licensing agreements should be most in demand.

Table 1.—Italy: Total expenditure for electric power systems by major end-user sectors, 1979, 1981, and 1986.

(in millions of U.S. dollars)

	1979	1981	1986
Expenditures by electric utility end-user sector			
Generation equipment			
Steam/boiler and turbines ...	226.96	176.28	420.4
Hydro turbines	47.05	35.73	50.0
Generators (steam, gas, hydro)	63.94	37.37	85.6
Generator sets (prime mover)..................	.60	01.36	2.3
Photovoltaic, wind, other renewable	6.41	3.72	14.0
Subtotal	344.96	254.46	572.3
Transmission and distribution equipment			
Capacitors (½ KV and larger)	4.45	3.29	4.0
Circuit breakers (15.5 KV and larger)	53.22	42.85	55.1
Conductors (overhead)	12.28	12.03	15.9
Distribution transformers	35.55	27.61	38.1
Power transformers	42.44	23.72	44.9
Instrument transformers	14.98	15.04	18.0
Voltage regulators (transmission and distribution)			
Subtotal	162.92	124.55	176.0
Total	507.88	379.01	748.3
Expenditures by industrial, commercial, institutional end-user sectors			
Generation equipment			
Conventional	61.22	54.42	79.8
Renewable	3.00	3.63	5.5
Subtotal	64.22	58.05	85.3
Transmission and distribution equipment..............	48.02	45.35	68.0
Total	112.24	103.40	153.3

Note: 1981 utilities data estimated on the basis of first 11 months.

Source: 1979 and 1981: ENEL, Direzione Produzione e Servizio Approvvigionamenti, CISPEL; 1986: International Trade Administration, Office of Trade Information Services research report, The Market for Electric Power Systems and Energy Conservation Equipment—Italy (see Additional Information box).

The market's evolution depends largely on how effectively the Government can put its 1981 Energy Plan into action. The construction of nuclear and coal-fired power plants is underway to make up for existing generation undercapacity and to lessen Italy's dependence on imported oil. However, substantial progress has been frustrated by political squabbling, red tape, and lack of popular acceptance of both coal and nuclear energy. Thus, how much of the Plan Italy's national public utility ENEL (Ente Nazionale per l'Energia Elettrica) will be able to achieve is an open question.

Tight money and legislative indecision have slowed development of the incipient energy conservation equipment market. Furthermore, many industrial end-users are not yet taking energy conservation very seriously. As a result, manufacturers are allowing only short payback periods for energy conservation investment and buying the least expensive equipment. The most promising sales opportunities lie in those industrial sectors traditionally based on U.S. technology, such as glass, petroleum, and computers.

Energy Resources and Use

Under Italy's Energy Plan, electric generating capacity is targeted to grow 5 percent per annum, reaching 270 billion kWh by 1990, to match expected increases in energy consumption. Energy consumption in 1980 totaled 164 billion kWh or 2,860 kWh per capita. Per capita consumption is considerably higher in the industrialized North and in Umbria and Sardinia, where energy-intensive industries are located, than in the less developed South. Only 294,000 residents—less than 1 percent of the total population—were not connected to the national power grid in 1980, primarily in areas such as the rugged Alps and Appennins, where connection to the power grid entails extremely high costs. The Energy Plan allocates about $453 million during 1981-83 to extend the power grid.

Italy lacks abundant energy resources—electricity produced from domestic sources contributed only 17 percent to total electricity consumption in 1979-80. Like other EEC countries, Italy is trying to reduce its dependency on oil. Oil imports dropped 20 million tons in 1980 to 89 million tons; continued decreases are expected as gas- and coal-fired plants are built and energy conservation measures take effect.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = 833.13 lira (1979), and 1102.64 lira (1981 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

The Government plans to invest some $2.3 billion for hydrocarbon prospecting and production during 1981-83. Oil reserves are estimated at 50 million tons, with 1980 crude output amounting to 1.8 million tons. Expenditures for drilling activities for 1981-85 are budgeted at $1.7 billion, 40 percent of which will be for offshore work. Natural gas reserves are assessed at 190 billion m^3, with production in 1980 totaling 12.5 billion m^3. A larger flow of gas from abroad is already assured with the completion of the Italy-Algeria gas pipeline. To slow the depletion of gas reserves, future output is limited to 7-8 billion m^3 a year. Mining of the high-sulfur coal deposits in Sardinia's Sulcis region is expected to reach 3.5 million tons/year in 7 years. Coal imports are also rapidly increasing, reaching 18 million tons in 1980.

Hydroelectric power, most prevalent in the mountainous areas, attracts investments of $227–272 million (mostly by ENEL) per year. About 70 percent of Italy's hydroelectric potential is already realized, generating 47.5 billion kWh of electricity in 1980. In the belief that revamping the small hydro plants once considered obsolete could reclaim 3,600 MW and 8,600 GWh, the Government is reexamining all hydro reserves for further possible use. Geothermal potential is largely unused, although ENEL and Agip are actively drilling wells. Only 10 percent of the total 100 GW/year geothermal resources are tapped, producing 2.7 billion kWh in 1980. Development of geothermal sources will require an investment of $355 million during 1981-83, according to current government plans.

Less importance is attached to solar energy development, targeted to receive $54 million during 1981-83. Solar energy remains experimental; the 1-MW solar plant in Adiano, Sicily, inaugurated in 1981, is the first of its kind and was made possible by partial financing from the European Economic Community (EEC). Swine and cattle breeding have made biomass an increasingly popular energy source in areas such as Emilia Romagna. Little is expected from Italy's limited uranium reserves, though a recent discovery in the Vedello valley is encouraging.

Electric Power System Market.

The market for generation equipment, an estimated $168 million in 1986, is expected to rebound strongly after the off-years of 1979 and 1981 caused by the economic recession, tight credit, and expensive money. For several years increases in electric power generation capacity failed to keep up with demand, and the resulting shortage of electricity could become a serious problem as industrial activity increases.

Improved economic conditions coinciding with acceleration of the Government's nuclear program, based on U.S. technology, and the building of new coal-fired power plants, should spark sales of all types of generation equipment. During 1981-86, utilities expect to increase expenditures on steam boilers and turbines by 19 percent a year and on generators (steam, gas, and hydro) by 18 percent. Other end users of generation equipment in the industrial, commercial, and institutional sectors are expected to raise their spending an average 8 percent a year. The slower private-sector rate is due to a low level of replacement of obsolete equipment and the lagging resumption of private investment.

Sales of transmission and distribution equipment are also expected to recover from the economic doldrums of 1979 and 1981, reaching $244 million in 1986. Increases in spending by industrial, commercial, and institutional end-users, predicted to average 8.4 percent per annum, should outpace expenditures by utilities, forecast to grow at 7.2 percent a year.

The Italian power generation equipment industry is dominated by a handful of local companies capable of manufacturing large components. These manufacturers plus several smaller Italian firms often produce electric power system equipment under licenses of third-country manufacturers. The modern high-quality equipment produced by local manufacturers is generally not as technically advanced as the higher priced American-made equipment. As a result, U.S. suppliers may experience high market demand for sophisticated products.

To date, U.S. and third-country companies supply less than a third of the generation equipment market and only 16 percent of the transmission and distribution equipment market. Much of this imported equipment is reexported by resident engineering companies, and a large share—40 percent in 1981—is made up of generation equipment parts. The great majority of big ticket items for domestic use are supplied locally. Continuation of a 'buy Italian' policy, competitive Italian prices, and ad hoc specifications geared toward Italian equipment should further strengthen the predominance of Italian firms. Even with expected rapid market growth, imports are predicted to rise only 1 percent a year during 1981-86 (see table 2).

Domestic suppliers.—More than 140 manufacturers produce generation equipment in Italy. While demand has averaged 1,500 MW a year between 1975-81, supply capacity is estimated to be 3,000-4,000 MW. The Ministry for State Industries is planning to restructure the industry by setting up two consortium-like organizations, one private and the other State-controlled.

Ansaldo, comprising companies that formerly belonged to the IRI-Finmeccanica group, is the largest manufacturer of generation equipment. Supplying 50 percent of all turbines and generators and two-thirds of all boilers to the Italian market, its sales reached $835 million in 1980, over a third derived from exports.

Under U.S. licenses, Ansaldo manufactures products covering the entire range of electricity generation equipment from coal and universal pressure oil boilers (Babcock & Wilcox) to steam turbines and vacuum breakers (General Electric). It has also acquired licenses from the Swedish ASEA for distribution transformers. A licensee of both nuclear technologies, Westinghouse's Pressurized Water Reactor (PWR) and GE's Boiling Water Reactor (BWR), Ansaldo is the only nuclear manufacturer in Italy. It is now looking for company acquisitions to expand into the transmission and distribution equipment market.

Table 2.—Italy: Imports of electric power systems, 1979, 1981, and 1986

(in millions of U.S. dollars)

	1979	1981	1986
Generation equipment			
United States	33.70	37.21	40.8
United Kingdom	7.81	15.86	11.2
Germany	10.97	11.47	14.5
France	11.21	8.24	12.2
All others	11.43	17.10	15.8
Total	75.12	89.88	94.5
Transmission and distribution equipment			
United States	2.82	4.43	4.0
Germany	14.83	7.91	13.0
France	3.98	4.19	4.0
United Kingdom	1.32	1.06	1.0
All others	5.59	9.76	7.0
Total	28.54	27.35	29.0
Total (combined)			
United States	36.52	41.64	44.8
Germany	25.80	19.38	27.5
United Kingdom	9.13	16.92	12.2
France	15.19	12.43	16.2
All others	17.03	26.85	22.8
Total	103.67	117.22	123.5

Source: ISTAT, Statistiche Mensile del Commercio con l'Estero, Dec. 1979, August 1981 (Jan.-Aug. cumulative).

Franco Tosi, with a 50-percent share of the steam turbine market and a one-third share of the boiler market, is Italy's second largest manufacturer of generation equipment with sales of $311 million in 1980. Like Ansaldo, it purchased several American licenses on steam turbines (Westinghouse) and boilers (Combustion Engineering, The Air Preheater).

FIAT TTG, manufacturing under a Westinghouse license, and Nuovo Pignone, fabricating the turbine housing into which imported rotors from GE are installed, are the main suppliers of gas turbine equipment. Through its Italian manufacturing subsidiary, Tecnomasio Italiano Brown Boveri (T.I.B.B.), the Swiss-German firm Brown Boveri Corporation (BBC) supplies about 20 percent of the generator equipment market. Other suppliers of generation equipment include Riva Calzoni (1980 sales of $58 million) which produces water turbines and Ercole Marelli ($102 million) which manufactures electric generators.

At least 15 medium-sized local firms produce motor-generator sets. A half dozen additional minor companies manufacture generation equipment under U.S. licenses.

The Italian transmission and distribution equipment industry consists mainly of firms with annual sales under $100 million. The largest, Societa Anonima Costruzioni Elettromeccaniche (S.A.C.E.), is a subsidiary of BBC. It supplies 30-50 percent of the circuit breaker market. Many of these companies also manufacture under foreign licenses, including IEL-Marelli which produces transformers under a Westinghouse license, and ICAR, which makes capacitors under license from Westinghouse. GE is directly involved in the market through two subsidiaries: Officie di Savigliano performs maintenance and reconditioning work on transformers and generators and Compagnia Generale di Elettricita (C.G.E.) manufactures instrument transformers, breakers, capacitors, and controls in five Italian plants.

U.S. suppliers.—U.S. technology is well regarded, clearly evidenced by the prevalence of U.S. licenses under which numerous Italian companies produce boilers, steam and gas turbines, electric generators, nuclear components, and, to a lesser extent, transmission and distribution equipment. American firms have traded on their solid reputation as technological leaders to become the primary foreign suppliers of generation equipment, with more than 40 percent of sales.

Equipment purchases from U.S. firms, both in the generation and transmission/distribution markets, are highly vulnerable to downturns in Italy's high-volume reexport business. A large portion of the demand for American products comes from Italian engineering companies whose foreign clients often specify U.S. equipment. Because they carry steep prices, imports of transmission and distribution equipment are projected to decline during 1981-86.

U.S. vendors can facilitate sales by offering more sophisticated components and more generous credit terms. They have an excellent opportunity to make inroads in the generation equipment market if, following the example of German companies, they concentrate on selling competitively priced, high-quality motor-generator sets in the 80-150 kVA range.

Third-country suppliers.—German firms such as AEG Telefunken, Deutz, KKK, M.A.N., Robert Bosch, and Siemens, traditionally the main suppliers of transmission and distribution equipment to Italian users, are forecast to retain their leadership, capturing 45 percent of the import market by 1985. Third-country suppliers with Italian subsidiaries, such as Brown Boveri and Escher Wyss (Switzerland), Siemens (Germany), and Merlin Gerin (France), offer imported items that can be integrated into their locally manufactured product lines. Foreign vendors can also find a receptive market by getting their products approved by ENEL, a technique proved effective by the Belgian firm Balteau. Other third-country companies target specific industries, where market niches may more easily be found. Siemens, for example, sells drives and controls to paper and pulp, textile, and mechanical firms, and the Swedish firm ASEA caters to the steel industry.

Energy Conservation Market

Interest in energy conservation has filtered from Government to small industrial firms, but there has been little spending in either the public or private sectors. Proposed legislation embodying strong energy conservation measures has been bogged down in political squabbling. The 1981 Energy Plan envisaged a 10-percent energy consumption cut over a 10-year period. Some $453 million was tentatively allocated for teleheating and $2.2 billion for energy conservation-related investment that would generate $9 billion in additional industrial investment. Based on these guidelines, Law 2383 was drafted and awaits approval. It set specific allocations for investment in high-efficiency generation and cogeneration equipment and energy-saving equipment for factories, with grants covering 25-30 percent of total costs, as well as outlays for an energy-saving demonstration project.

In industry, energy-intensive firms have taken the lead in instituting energy-saving programs. The steel sector is aiming for a 7-percent energy consumption reduction and the petrochemical sector, a 10-percent reduction. However, with money still tight and the outcome of Law 2383 still uncertain, most industrial firms, with the exception of pharmaceutical companies and subsidiaries of multinational corporations, are taking only small cautionary first steps toward energy conservation, such as better maintenance and tuning of boilers and furnaces, power factor improvement, use of oil-emulsifying burners, better insulation, and heat recovery without heat exchangers. Large manufacturers have, for the most part, corrected obvious misuses of energy when payback is expected to occur in less than 1 year. Most major energy problems require longer payback periods, however, and these are being relegated to the backburner. Small and medium-size firms, though interested in cogeneration because of fear of power blackouts, have shown even less flexibility, taking only the simplest and least expensive measures. While recommending double-pane windows, better insulation, and occasionally, solar panels, architects and engineers find it difficult to convince clients to spend money on these items. In such a tight-fisted climate, only inexpensive off-the-shelf products are considered marketable.

Despite the overall sluggishness of the market, special needs among certain end-users should spur future sales. County and municipal authorities, for example, are actively exploring the possibility of teleheating (providing home heating by recovering waste heat from existing power plants or incinerators), energy-efficient lighting, and incinerators. Hospitals and hotels are interested in cogeneration. Schools and hotels are increasingly considering solar panels for hot water and heated swimming pools, respectively. The rapidly increasing market for Automated Energy Management Systems (A.E.M.S.) used in large office buildings, estimated at $12 million in 1981, should provide excellent sales opportunities for U.S. manufacturers.

U.S. vendors should expect a highly competitive market for energy-saving equipment. Though domestic suppliers often lack technical sophistication, they are very price competitive and produce high-quality equipment for process control instrumentation, sensors, and A.E.M.S. German firms put out an impressive array of equipment for this market, including energy-efficient heat-treating and cement furnaces, process control instrumentation, heat recuperators, heat pumps, and burners. Swiss companies specialize in A.E.M.S. equipment, and firms from Sweden supply high temperature heat exchangers.

Overall, the most marketable energy conservation items include:

High-temperature exchangers
Large, energy-efficient burners, especially for incinerators
Screw-type compressors
Capacitors for power factor correction
Amorphous laminations for transformer cores
Self-cleaning heat pipes
Oil-emulsifying burners
Low-energy consumption lighting systems
Process control sensors and systems
Fans for redistributing warm air in buildings.

Advisory Services

A number of well-known engineering companies, stationed in Italy, moved abroad when the market declined. The firms that remained concentrate more on process engineering than on electric power generation.

Three different types of organizations have stepped into the breach. The first, ENEL, has developed a large engineering staff. It has its own standards by which components are purchased and then installed by subcontractors, except for boiler-turbine generators installed directly by the manufacturer. A 1981 law now allows ENEL itself to become a technical advisor to municipal authorities and clients abroad, alone or in association with other Italian firms. The second comprises large manufacturers that either have engineering departments or, like Tosi and Ansaldo, have set up captive engineering companies. The third type consists of several very small outfits offering engineering services in generation and transmission and distribution to non-utility clients. Their lack of technical sophistication is offset by close personal contacts with few clients.

All these firms are Italian, foreclosing opportunities for U.S. consultants and contracting engineers. ENEL, which does most of the contracting, intends to work even more closely with Italian manufacturers on advanced technology relating to combustion, electrostatic filters, teleheating, and energy conservation.

End-User Sectors

ENEL, the Government-controlled, national electric utilities company, supplies over 95 percent of the publically produced electricity; the remainder is provided by the municipal utility authorities. The combined capacity of the public utilities reached 37,000 MW in 1979 (see table 3). A number of private firms, mostly in the energy-intensive steel, oil, paper, chemical, and textile industries, generate their own electricity, providing approximately 17 percent of all electricity consumed in Italy.

ENEL has overall responsibility for generating and distributing electricity to the whole country. Its eight Compartimenti are subdivided into 24 Distretti. ENEL controls about 800 generating units; 90 MW is the standard size for a turbogas unit; 320 MW for oil; and 660 MW for coal.

Table 3.—Italy: Generating capacity of Public Utility Board 1979, 1981, 1986 and 1991

(in megawatts)

	1979	1981	1986	1991
Hydro	10,150	10,311	11,240	13,200
Pumped storage	3,545	3,672	8,560	10,000
Total	13,695	13,983	19,800	23,200
Fossil steam				
Coal	4,800	5,130	5,400	9,400
Oil	12,392	14,024		
Gas	4,028	4,028	25,500	26,000
Total	21,220	23,182	30,900	35,400
Nuclear steam	1,437	1,471	2,000	5,000
Internal combustion	—	—	.1	.1
Gas turbines	1,098	1,438	2,200	3,000
Geothermal	.4	.4	.6	.7
Solar	—	—	—	.1
Grand total	37,450.4	40,074.4	54,900.7	66,600.9

Source: 1979 and 1981: ENEL, Produzione e Consumo di Energia Elettrica in Italia; 1979 and 1981: unpublished revision; 1986 and 1991: International Trade Administration, Office of Trade Information Services research report.

The 160 municipal utilities and some other small independent utilities are not under ENEL jurisdiction. These municipal authorities typically distribute electricity, as well as water and gas, for small urban areas. About 50 of them belong to CISPEL (Confederazione Italiana dei Servizi Pubblici degli Enti Locali). Authorities in five major cities plan to add almost 525 MW of generating capacity by 1985. Teleheating projects are planned for 10 cities, and 5 cities will obtain power generated by incinerator exhaust.

Italy's 1981 Energy Plan calls for an ambitious power plant building program to make up for past years when capacity increases lagged behind demand. However, major obstacles must be overcome for ENEL to successfully implement the program. The Government has had difficulty securing approval for sites for new nuclear and thermal power plants. Since Italy has never relied on coal to any great extent, an extensive infrastructure of coal transportation and handling plus waste disposal has to be built for coal-fired plants. ENEL obviously needs money to embark upon these varied projects, yet it has suffered a critical revenue shortage in recent years. As a result, its investments in 1979-81 were far below normal (see table 4), and with the 1982 investment budget slashed by $1.4 billion, no immediate relief is in sight. ENEL's building program will face drastic reductions if additional infusions of money are not soon forthcoming.

Limited capital has already forced ENEL to concentrate all remaining resources on completing unfinished power plants such as the Montalto di Castro nuclear units. Given the additional maze of bureaucratic obstacles hindering Italy's nuclear program, it seems almost certain that the Energy Plan's 1991 target of seven to eight 1,000-MW operating units, or ENEL's goals which are even more ambitious, will not be reached. It is more likely that only one 1,000-MW nuclear unit will be added to Montalto's 2,000-MW capacity.

Gas turbine power plants are currently used to meet peak demand, but ACEA, the Rome Municipal Authority, plans to install a unit for cogeneration. Methane is already in short supply, as evidenced by the Turin Municipal Authority's inability to run its gas turbine generator for lack of fuel. ENEL plans no new plants for peak demand purposes.

End-users in the commercial and institutional sectors buy backup systems. These organizations, including service data centers, banks (for their captive computer rooms and security systems), large department stores, sports arenas, airports, and hospitals prefer conventional motor-generator sets to protect against blackouts. Government authorities are considering broadening legislation which makes electric backup systems mandatory for hospital operating rooms and intensive care units.

Table 4.—Italy: Planned capital expenditures by electric utilities, 1979, 1981, 1986, and 1991

(in millions of U.S. dollars)

	1979	1981	1986	1991
Generation				
Fossil	755.0	662.0	1,085.0	1,330
Nuclear	128.4	158.7	589.5	1,225
Hydro	30.0	99.4	322.0	445
Pumped storage	240.1	149.1	118.0	90
Gas turbine	52.8	77.1	—	—
Internal combustion	1.2	2.7	4.5	10
Geothermal - solar	21.6	53.5	81.5	100
Total	1,229.1	1,202.5	2,200.5	3,200
Transmission	126.0	127.9	166.0	215
Distribution	984.2	730.1	934.0	1,125
Miscellaneous	120.0	136.0	159.0	180
Total	2,459.3	2,196.5	3,459.5	4,720

Source: ENEL financial statement 1979; CISPEL, Compendio Statistico 1979; ISTAT, Fatturato, prodotto lordo e Investimenti delle Imprese Industriali, Commerciali, Trasporti e Comunicazioni, 1979.

Manufacturers also need backup systems, lest they risk costly interruptions of continuous process operations. Food processing, stone-clay-glass, and a few pharmaceutical firms are already investing in auxiliary power systems, and companies in other process industries are apt to follow their lead in the near future.

Stone, clay, glass and concrete products.—Firms in the stone, clay, glass, and concrete products industry have announced plans for the addition of 9.6 MW of generating capacity in 17 plants. The industry consists of 2,539 manufacturing firms of over 20 workers, employing 215,000 people in 1979. Sales in 1979 amounted to $10.3 billion, and investment totaled $810 million. Fifty-five of these companies have over 500 employees and account for 35 percent of total industry sales.

Concerned about rising energy costs, many of these firms have adopted energy-saving measures. Ceramic tile producers seek better insulating materials, energy-efficient kilns, and more sophisticated instrumentation to monitor and control excess air in the mixing, drying, and firing stages. While making greater use of computers, cement manufacturers have replaced wet grinding with the more energy-efficient dry operations, and replaced Portland cement with cement containing blast furnace slag. For glass producers, restructuring tank furnaces, changing over to the float glass process, and replacing conventional furnace loads with recycled glass on pallets all offer energy-saving alternatives. Brick manufacturers are exploring ways to use solar energy and heat pumps for brick drying.

Recently developed tunnel kilns are being used to save energy. In addition, new, fast-firing kilns have proved to be 20-40 percent more energy efficient than previous models. However, because fast-firing kilns cost so much, sales to date have been limited.

Food processing industry.—Food processors have announced the addition of 25 MW of cogeneration capacity. The 2,052 manufacturers with more than 20 workers employed 208,000 people in 1979, sold $27.7 billion worth of goods, and invested $827 million. Sixty-four of these firms, with over 500 employees each, accounted for 29 percent of total sales.

This industry, with its large amounts of organic waste and steam and hot water needs, is strongly attracted to cogeneration. Gas obtained from biomass is often used as a fuel. Oil and wine producers convert grape husks and olive cakes which they used to throw away into energy. Tomato and sugar processing plants recover heat in milk pasteurizing machines and from breweries' mixing vats. An increasing number of evaporators is being used to make fruit preserves and tomato paste. Even solar panels are being used to dry tobacco leaves and, perhaps in the future, to dry fruits and vegetables.

Marketing Access

Marketing practices.—U.S. producers must keep an attentive ear to the market, since ENEL rarely advertises bids. The most effective channel for distributing electric power systems is an Italian-based manufacturing subsidiary. Distributors who frequently assemble ancillary equipment also play an important role in the market. Unless prototypes are involved, sales subsidiaries and agents are ineffective because direct sales usually involve engineering companies receiving goods directly from the manufacturer on behalf of a foreign client.

Low price is not crucial in transactions involving unique generation equipment with little domestic competition. However, for transmission and distribution equipment where competition from local suppliers is stiffer, price is a key factor in the purchase decision. With credit so tight, a competitive edge may be obtained by offering liberal credit terms. Oddly enough, some end-users regard long lead times a bonus during times of low investment. Foreign suppliers are expected to match the prompt service provided by Italian manufacturers and distributors and carry an adequate inventory of spare parts.

Regulations and technical requirements.—Imports from EEC countries are duty free. From other countries, duties range between 5.0 and 5.5 percent for most generation equipment; nuclear reactors carry a 9.1-percent tariff. For transmission and distribution equipment, duties range from 6.0 to 9.9 percent. In addition, a 15-percent value-added tax is charged on landed value plus duties.

Additional Information

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The Survey summarizes a 64-page International Market Research (IMR) report prepared by J.B.A. in Italy, under contract to the U.S. Department of Commerce and reflects the opinions and views of interviewees in Italy and not those of the Department of Commerce. A copy of this report may be purchased from:

National Technical Information Service
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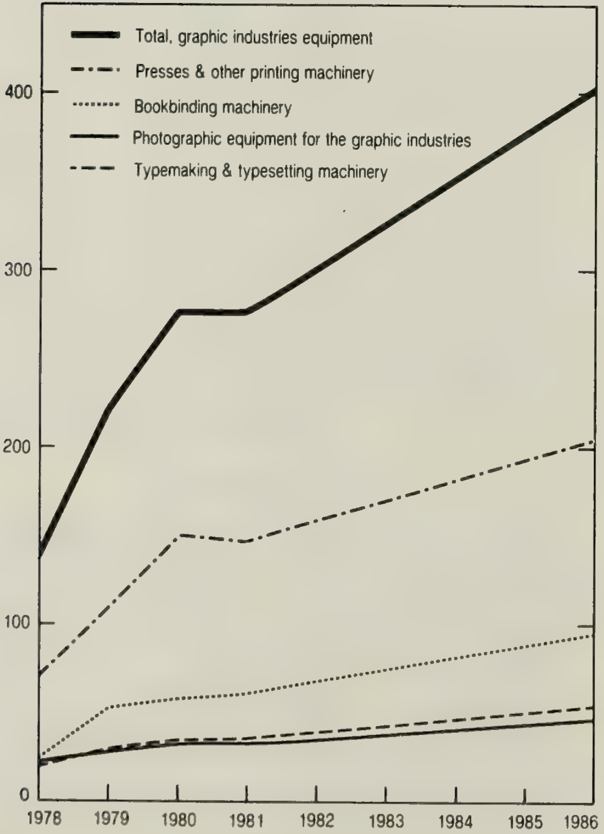
Italian printers, faced with rising labor costs, low productivity, and customer requirements for high quality printed matter, expect to increase their investments in new machinery an average 8 percent annually, from nearly $276 million[1] in 1981 to more than $400 million in 1986 (see table 1 and figure 1). Their expenditures will be aimed primarily at increasing automation, raising working speeds, and improving quality control. A new law providing financial assistance for publishing/printing houses should also stimulate equipment purchases. These positive influences in the marketplace are offset somewhat by high interest rates, the attitude of trade unions, and frequent worker opposition to new techniques.

Typemaking and typesetting machinery.—The shift from hot metal to phototypesetting is far from being completed in Italy and is expected to sustain demand for typemaking and typesetting machinery for many years. Sales are projected to rise more than 9 percent yearly to $55 million in 1986. Phototypesetting techniques are being applied in virtually all sectors of the market—in large newspaper, magazine, and book printing plants, as well as small commercial or in-plant printing shops. The large establishments particularly appreciate the higher productivity of phototypesetting and are ready to accept advanced decentralized phototypesetting methods. Sales potential is good for the following items:

Figure 1.—Italy: The market for graphic industries equipment, 1978-86

(in millions of U.S. dollars)



Source: See source notation of table 1.

Direct entry phototypesetting systems
Phototypesetting systems with cathode ray tubes (CRT's)
Central processing units (CPU's) for phototypesetting systems
Visual display terminals (VDT's) with editing capacities
Memories (fixed disk or removable disks and integrated circuits)
Disk- and tape-driven units
Optical character recognition (OCR) equipment
Display ad/full-page photocomposition systems
Keyboard entry (on-line, off-line, remote) devices
CRT output units
Hard copy printers
Offset platemaking equipment
Equipment for the electronic preparation of gravure cylinders

The 1986 market for direct entry phototypesetting machines is projected to reach $14.5 million (see table 2). A big backlog of demand for these relatively simple and inexpensive systems exists among small and medium-sized printing shops. Direct entry devices are considered cost efficient and are appreciated for the high quality of their output. They are becoming the standard for small printing shops and for larger plants as off-line machines or standby equipment for special jobs.

Phototypesetting systems with CRT's are expected to enjoy continued demand because they offer high working speed and cost efficiency. Sales are predicted to climb almost 14 percent annually to a 1986 level of $9.5 million. These systems are especially attractive to large end-users who have to replace outdated equipment and increase productivity in order to survive under difficult economic conditions. Italian printers are particularly interested in low-cost CRT units that still feature flexibility and assure improved productivity. Laser techniques are also making inroads in the Italian market where 10 units have already been sold by Monotype (United Kingdom).

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[1] All values are shown in U.S. dollars; local currency data are converted at the following exchange rates: US$1=849 Lire (1978), 831 Lire (1979), 856 Lire (1980), and 1,136 Lire (1981 and subsequent years). Values for years through 1981 are expressed in current rather than constant dollars; values for 1982 and subsequent years are expressed in 1981 constant dollars.

Table 1.—Italy: Size of market for graphic industries equipment by major subcategories, 1978-1981 and 1986

(in millions of U.S. dollars)

	1978	1979	1980	1981	1986
Typemaking and typesetting machinery					
Production	6.7	8.2	8.8	14.7	23
Imports	14.2	22.9	28.1	24.8	42
Exports	1.0	1.4	1.5	4.4	10
Market size	19.9	29.7	35.4	35.1	55
Photographic equipment for the graphics industries					
Production	14.5	17.4	19.0	19.5	28
Imports	12.5	17.5	20.1	20.0	30
Exports	4.5	5.4	6.3	6.5	11
Market size	22.5	29.5	32.8	33.0	47
Presses and other printing equipment					
Production	98.1	115.8	142.4	144.5	230
Imports	36.0	71.8	95.7	94.7	130
Exports	64.1	79.3	88.3	92.5	155
Market size	70.0	108.3	149.8	146.7	205
Bookbinding machinery					
Production	21.9	57.1	56.3	59.8	98
Imports	11.6	20.7	24.6	26.5	41
Exports	9.2	24.8	23.1	25.4	44
Market size	24.3	53.0	57.8	60.9	95
Totals					
Production	141.2	198.5	226.5	238.5	379
Imports	74.3	132.9	168.5	166.0	243
Exports	78.8	110.9	119.2	128.8	220
Market size	136.7	220.5	275.8	275.7	402

Source: International Trade Administration, Office of Trade Information Services research report, The Market for Graphic Industries Equipment—Italy (see Additional Information box).

The growing use of electronic data processing in typesetting is boosting the demand for central processing units. The spread of advanced decentralized phototypesetting techniques is expected to widen the market for a variety of peripherals, which are increasingly bought by original equipment manufacturers (OEM's).

Offset printing techniques are gaining acceptance in the Italian printing industry, leading to demand for fast-working, easy-to-operate offset platemaking machines. Use of automated or semiautomated platemaking equipment is increasing, and presensitized plates are favored. Offset platemaking equipment sales are forecast to expand from $5.5 million in 1981 to $8 million in 1986. Equipment for electronic preparation of gravure cylinders is also projected to enjoy good sales as the use of gravure presses expands.

Sales of photocomposition machines for display ads or full-page layout are projected to rise to $5.5 million in 1986, with the real breakthrough expected in the second half of the decade. Printers are concerned about the adequacy of the software provided and the size of the memories required. The technique is being studied very carefully by the newspaper association, which keeps its members informed of new developments. The association anticipates widespread acceptance of this method when it has been perfected.

Photographic equipment.—The market for photographic equipment is projected to grow at a steady 7-percent annual rate, reaching $47 million in 1986, as Italian printers increasingly turn to new automated, easy-to-operate equipment to produce higher quality products. An expanding market is projected for:

Process cameras
Color separation scanners
Automated film processors
Enlarging/reducing equipment

Sales of process cameras are expected to grow more than 10 percent annually to a 1986 level of $9 million. Most printers are still using relatively unsophisticated photographic equipment, but the trend toward better quality is pushing the graphics industry to buy more expensive process cameras. Electronically controlled units, both vertical and horizontal, are expected to be in demand. Emphasis is still on the lower end of the market, mainly sizes less than 60 × 60 cm., but sales of larger units are also gaining momentum.

The graphics industry is well aware of the economic and technical advantages of advanced electronic scanners, and an estimated 160-180 color separation scanners are already installed in Italy. With demand rising for improved quality and multicolor printing, the industry is ready to increase its investments in costly electronic scanning devices. A 1986 market of $5 million is predicted.

Automatic film processor sales are expected to reach $5 million in 1986, escalating almost 11 percent yearly from a 1981 level of $3 million. Italian printshops show vivid interest in automated and semiautomated film processing equipment because of the mounting costs of manual processing. These processors are also favored because of improved and constant quality of the developed film as well as shortened processing time. Rapid access and daylight equipment is predicted to be in special demand. Good sales of enlarging/reducing equipment are anticipated as the graphics industry turns to the new automated, easy-to-handle enlargers and reducers.

Presses and other printing machinery.—The market for presses is predicted to grow 7 percent annually, from $147 million in 1981 to $205 million in 1986. The shift from letterpress to offset techniques is taking place at a faster pace in Italy than in other European countries. Despite the dramatic gains in offset equipment sales in recent years, a vast sales potential for offset machines of all sizes and types still exists. The outlook is particularly good for:

- Web-fed offset presses
- Sheet-fed offset presses
- Ultraviolet (UV) drying equipment for offset printing presses
- Flexographic presses
- Gravure presses
- Special machinery for the printing of labels and bar codes
- Embossing or stamping machines

Sales of web-fed presses are forecast to rise from $31.4 million in 1981 to $46 million in 1986 as the Italian printing industry increasingly shifts to this technique. Sales of sheet-fed offset presses have shown a rising trend for many years, and the market is projected to widen from $33.3 million in 1981 to $44 million in 1986, as small and medium-sized plants take advantage of their high productivity, good quality output, and reasonable prices. About 12,000 sheet-fed presses are already installed in Italy, approximately one-fourth of them more than 10 years old.

The market for flexographic presses, which had been strong in the 1970's and then flattened out when economic conditions worsened, is expected to grow again as the Italian economy recovers. Sales are predicted to rise 9.6 percent annually to $18 million in 1986. Italy has little timber and limited paper production, which resulted in the early use of plastic and aluminum foils for packaging materials; both are particularly suited to flexographic presses. The anticipated upswing in the printing of packaging materials also favors sales of gravure presses, with the market forecast to grow almost 9 percent a year to a 1986 level of $29 million. Gravure printing is widespread in Italy, with approximately 90 presses currently in place.

Sales prospects are good for UV drying equipment because a mounting number of printers feels this method speeds up production, improves quality, and helps to control production costs. Special equipment for the printing of labels and bar codes as well as embossing and stamping machines are expected to be in increasing demand to print packaging material (particularly in the food processing industry).

Bookbinding machinery.—Strong demand for bookbinding machinery is predicted, to meet the untapped potential for integrating collating, bookbinding, and packaging operations. Sales are forecast to climb 9 percent annually, reaching $95 million in 1986. Italy had comparatively low wage levels in the past, so bookbinders had no incentive to invest in laborsaving machinery. Now, with labor costs growing rapidly, sales prospects are good for automated collating, folding, binding, and packaging equipment. With today's high-speed printing processes, collating in particular is becoming a bottleneck in many Italian printshops; thus, printers seek reliable, automated or semiautomated, reasonably priced collating systems. In general, the trend is toward book production lines added to printing machines or integrated into complete printing systems.

Table 2.—Italy: Total market and imports from the United States of selected types of graphic industries equipment, 1981 and 1986

(in millions of U.S. dollars)

	1981		1986	
	Total market	Imports from the U.S.	Total market	Imports from the U.S.
Direct entry phototypesetting machines	10.0	2.5	14.5	3.5
Tape driven phototypesetting machines				
—without CRT's	4.0	1.2	5.5	1.5
—with CRT's	5.0	2.5	9.5	4.5
Keyboard data entry machines	3.0	.7	5.5	1.5
Video display terminals	2.5	1.2	6.0	2.5
Photocomposition machines for display ads or full page layout	3.0	.8	5.5	2.0
Multistation copy entry systems	2.5	1.0	5.5	2.5
Offset platemaking equipment	5.5	.6	8.0	1.0
Process cameras	5.5	1.0	9.0	1.5
Lighting systems	2.5	.2	3.0	.3
Color separation scanners	3.5	.8	5.0	1.3
Automatic film processors	3.0	1.5	5.0	2.4
Sheet-fed offset presses	33.3	1.5	44.0	2.5
Web-fed offset presses	31.4	4.1	46.0	6.5
Flexographic presses	11.4	.1	18.0	.5
Gravure presses	19.0	—	29.0	—
Quality control equipment	4.5	.7	7.5	1.3
Materials handling equipment	7.0	.5	11.0	1.0
Pollution control equipment	1.0	.2	1.5	.3

Source: See source notation of table 1.

Miscellaneous equipment.—Quality control is very important in Italy, where printing is considered an art. Quality control instruments are increasingly used to reduce the amount of waste paper in the printing process. The general trend toward thinner paper requires improved web control, and densitometers are used both to improve printing quality and to help reduce costs caused by misprints. Sales of quality control equipment are predicted to rise almost 11 percent annually to $7.5 million in 1986. Prospects are especially good for sophisticated densitometers with digital readout.

Demand for materials handling equipment is projected to grow from $7 million in 1981 to $11 million in 1986 as printers try to eliminate or reduce manual work. Web guides are of particular interest as high paper prices force the industry to try to reduce waste.

The market for pollution control equipment, although still small, is expected to grow more than 8 percent yearly to a 1986 level of $1.5 million. Air pollution from offset processes and water pollution from polymer platemaking are of most concern.

Competitive Environment

Imports satisfied 60 percent of the Italian market for graphic equipment in 1981 and are expected to stay at this level through 1986. The domestic industry does not offer a full range of advanced machinery but specializes in certain areas, such as various kinds of presses, and is largely geared for export. Domestic production is forecast to increase almost 10 percent yearly to $379 million in 1986, with exports rising from 54 to 58 percent in the 1981-86 period.

German manufacturers are by far the most important foreign suppliers, accounting for 52 percent of imports in 1981 (see table 3). German firms clearly dominate imports of presses (61 percent) and also lead in bookbinding machinery (43 percent), photographic equipment (40 percent), and typemaking machinery (38 percent). Their position is weakening somewhat since German prices for many standard machines are now considered prohibitive by Italian buyers. U.S. suppliers claim a strong second place in typemaking machinery (34 percent) and, to a lesser extent, in photographic equipment (18 percent). Swiss firms account for a sizable 26 percent of bookbinding machinery imports.

U.S. position.—With the growing demand for advanced laborsaving machinery and the increasing computerization of the printing industry, U.S. firms expect to improve their competitive position, pushing their sales from 13 percent of imports in 1981 to almost 17 percent in 1986 (see figure 2). Shipments are projected to grow almost 14 percent annually in the 1981-86 period, reaching a level of $40.8 million. Sales of U.S.-made typemaking and typesetting machinery are forecast to account for a significantly larger share of imports, with American photographic equipment, presses, and bookbinding machinery also claiming larger shares of the import market.

Table 3.—Italy: Imports of graphic industries equipment by major subcategories and country of origin, 1978, 1980-81, and 1986

(in thousands of U.S. dollars)

	1978	1980	1981	1986
Typemaking and typesetting machinery				
United States ..	8,070	12,215	8,400	19,500
Germany	3,410	10,000	9,400	
Switzerland	1,540	2,302	2,740	
United Kingdom	440	2,400	2,040	
Others	740	1,183	2,220	
Total	14,200	28,100	24,800	42,000
Photographic equipment for the graphic industries				
United States ..	2,400	3,700	3,600	6,000
Germany	5,000	7,900	8,000	
Japan	1,000	1,500	1,400	
United Kingdom	800	1,200	1,300	
Denmark	800	1,300	1,300	
Others	2,500	4,500	4,400	
Total	12,500	20,100	20,000	30,000
Presses and other printing machinery				
United States ..	2,580	5,405	5,900	10,000
Germany	21,930	64,220	58,000	
France	2,430	6,390	7,400	
United Kingdom	3,005	6,690	3,700	
Switzerland	1,200	3,590	3,300	
Netherlands	1,110	2,887	2,200	
Others	3,745	6,518	14,200	
Total	36,000	95,700	94,700	130,000
Bookbinding machinery				
United States ..	1,770	2,590	2,900	5,300
Germany	5,150	10,800	11,500	
Switzerland	2,820	6,530	6,900	
Others	1,860	4,600	5,200	
Total	11,600	24,520	26,500	41,000
Grand total	74,300	168,420	166,000	243,000
Total imports from the U.S.	14,820	23,910	20,800	40,800

Source: See source notation of table 1.

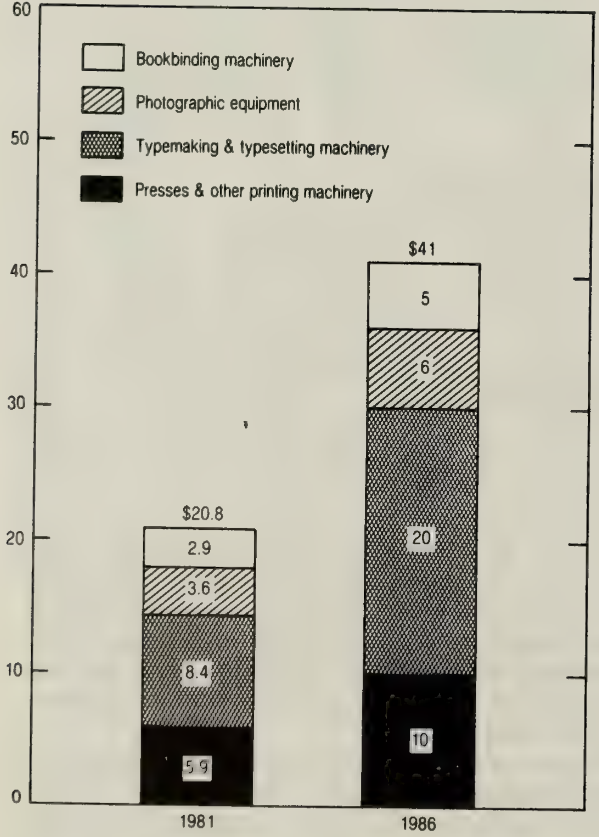
American manufacturers of **typemaking and typesetting machinery,** benefiting from their technical lead in computer techniques, anticipate sharp 18-percent annual sales increases, with 1986 shipments totaling $19.5 million. Sales of American-made products are expected to climb from one-third to almost one-half of all imported prepress items, with good sales opportunities for:

- Direct entry phototypesetting systems
- Phototypesetting systems with CRT's
- Central processing units (CPU's) for phototypesetting systems
- Keyboard data entry machines
- Video display terminals (VDT's)
- Multistation copy entry systems

By adding more sophistication such as enlarged memories, faster working speed, or CRT output to their direct entry phototypesetting systems, American suppliers are expected to maintain a strong position in the upper end of the market, with 1986 sales projected at $3.5 million. American-made phototypesetting systems with CRT's are highly appreciated by Italian customers because of U.S. superiority in the electronics field. In addition, U.S. suppliers offer software specifically designed for Italian needs and are considered price competitive. Sales by U.S. companies are forecast to rise 12.5 percent annually to $4.5 million in 1986 because little serious domestic or third-country competition is likely to emerge during the period. U.S. manufacturers of typesetting equipment are also expected to make inroads in the market for laser equipment. Linotype has already entered this market and is expected to do well because of its reputation and established European marketing network.

Figure 2.—Italy: U.S. sales of graphic industries equipment, 1981 and 1986

(in millions of U.S. dollars)



Source: See source notation of table 1.

U.S. manufacturers of computers and related equipment for phototypesetting systems are the undisputed leaders in the field and are expected to maintain this position. Many U.S.-made CPU's are sold to OEM's in West Europe who supply the Italian market.

Several types of peripheral equipment are predicted to be in greater demand as Italian printing plants apply advanced decentralized phototypesetting techniques. Sales prospects are bright for keyboard data entry machines and video display terminals, since most of these items are either made in the United States, assembled from American-made components, or produced under U.S. license. Most of the U.S.-made peripherals reach the Italian market indirectly by OEM sales or sales to system houses.

American vendors also lead in sales of multistation copy entry systems and are expected to expand their share of the market from 40 percent in 1981 to 45 percent in 1986. Sales by U.S. firms are predicted to reach $2.5 million in 1986.

Linotype, Compugraphic (a subsidiary of Agfa-Gevaert/Bayer, Germany) and Autologic are among the market leaders in phototypesetting equipment. Other important U.S. suppliers include Harris, IBM, Itek, and 3M (Minnesota Mining and Manufacturing Co.). Atex, AKI Automix Keyboard, Inc., Bell & Howell, and Visual Graphics are also active vendors of phototypesetting equipment. Compuscan and ECRM offer optical readers; Napp and Polychrome ship platemaking equipment, and Raytheon supplies VDT's.

U.S. shipments of **photographic equipment** are predicted to increase almost 11 percent annually from $3.6 million in 1981 to $6 million in 1986, as Italian printers turn to more sophisticated equipment in which American manufacturers have a competitive edge. Sales prospects are best for automatic film processors that are rated well for their price/performance ratio. American vendors currently supply about half the film processors on the Italian market and expect to maintain almost that share with 1986 sales of $2.4 million. Most of the sales are expected in the more technologically advanced end of the market, including rapid access and daylight equipment.

In process cameras, U.S. suppliers may be able to get a foothold in the higher end of the market where computerization plays an important role. Shipments are forecast to reach $1.5 million in 1986, just under 17 percent of sales.

Among the major suppliers of photographic equipment are DuPont de Nemours, Kodak, NuArc, 3M, and Pako, which finds a particularly good market in Italy because of its already strong position as a film supplier. Berkey Technical and Logetronics are also active in the market for photographic equipment.

Known for their experience and reliability, U.S. suppliers of **presses and other printing machinery** can expect sales to grow at a healthy 11-percent annual rate to $10 million in 1986. The outlook is promising for:

Web-fed offset presses
Sheet-fed offset presses
UV drying equipment for offset presses

Shipments of American-made web-fed presses are forecast to climb from $4.1 million in 1981 to $6.5 million in 1986, because they are known for their reliability and are considered price competitive. Product support is also rated as excellent. Market observers see particularly good sales opportunities for rotary presses to newspaper plants and for miniwebs to small commercial and in-plant printing shops.

While U.S.-made sheet-fed offset presses are selling slowly, they have gained a good reputation as the core of an integrated printing process from copy entry to final product, an appealing option for shops producing small and medium runs. Sales are projected to rise almost 11 percent yearly from $1.5 million in 1981 to $2.5 million in 1986.

UV drying equipment from American firms is well known among Italian end-users and is considered proven and reliable. Some specialized U.S.-made machines for the printing of labels and aluminum and plastic foils are also competitive because of their high performance.

Companies which have been active in the Italian market include A.M. International, ATF Davidson, A.B. Dick, Harris, Itek, Rockwell-Goss, Didde Glaser, and King Press (offset presses); Dahlgren (dampening and dilitho equipment); and Marken (label printing equipment).

For **bookbinding machinery,** those companies offering complete bookprinting and binding lines enjoy good sales prospects, with imports of American-made equipment projected to climb almost 13 percent annually to $5.3 million in 1986. Machines expected to be in special demand because of technical features include perfect binders, saddle stitchers, and complex collating equipment. Harris, Bostitch, and McCain are among the firms supplying such machinery; Kroy sells papercutting equipment; and Signode ships bundling equipment.

Sales of **other U.S.-made equipment,** although relatively small, are expected to grow at fairly rapid rates: 13 percent annually for quality control equipment, 15 percent for materials handling equipment, and 11 percent for pollution control equipment. Firms such as Cosar, Macbeth, and X-Rite have particularly good reputations for easy-to-operate densitometers with digital readouts. Other types of quality control instruments expected to be in demand include hygrometers, viscosimeters, and pH-meters.

Italian printers admire the quality of U.S.-made printing equipment and are ready to accept new American techniques, often associating technical progress with developments originating in the United States. Most end-users also praise U.S. product support and agree that American companies are represented by competent Italian trading houses or maintain efficient sales organizations of their own. Changing representation in Italy may prove to be a disadvantage for American companies, because Italian customers rely on long-established business relations.

The latest revaluation of the dollar against the lire has made U.S. equipment very expensive in Italy, weakening the competitive power of American suppliers. The value of the dollar relative to the lire rose 34 percent between 1978 and 1981.

Italian distributors generally praise the cooperative attitude of their American partners, but cite some room for improvement in their responsiveness. Shorter delivery times, assistance in extending servicing facilities, product literature in the Italian language, and adaptation of electrical equipment to Italian standards would all help to improve U.S. export marketing activities.

Other foreign suppliers.—German firms, clearly the leading foreign suppliers of printing equipment, are known for the high quality of their machinery. They are also favored by the European currency system that stabilizes the rate of exchange between the lire and the German mark regardless of much higher inflation rates in Italy. Well-known firms such as Albert Frankenthal, Heidelberger Drucksmaschinen, Goebel, MAN-Roland, Miller Johannisberg, and Konig & Bauer maintain the unchallenged German lead in shipments of printing presses. Berthold, Dr. Hell (Siemens), and Mergenthaler Linotype (a U.S. subsidiary) are major suppliers of phototypesetting equipment. Dr. Hell is also a market leader for electronic scanners, and Hoh & Hahne Hohlux as well as Klimsch sell process cameras. Kolbus and Wohlenberg are important vendors of bookbinding equipment, and Stahl is a major supplier of folding machines.

Other third-country suppliers have comparatively small shares of the import market, but a number of countries are well represented. Swiss vendors have long enjoyed good business relations with their Italian neighbors. Firms such as Hunkeler and Muller Martini supplied $6.9 million worth of bookbinding machinery in 1981. Typesetting equipment, sold by Bobst Graphic (a U.S. subsidiary) and Guttinger (a subsidiary of Berthold, Germany), also enjoys good standing in Italy. Bobst (letterpress and flexographic equipment), Color Metal (sheet-fed offset presses), and Wifag (web-fed presses) are major vendors of printing machinery. Other important Swiss suppliers include Ferag (materials handling equipment), Gietz (foil stamping machines), and Gretag (densitometers).

British firms that have a foothold in the market for certain types of sophisticated machinery include Monotype with laser typesetting machines and Crosfield Electronics, a market leader in electronic scanners. Offset presses are marketed by Crabtree Vickers, Gestetner, and Rockwell Goss (a U.S. subsidiary). Another U.S. subsidiary, Linotype Paul, sells phototypesetting equipment. Grace Letterflex is an important supplier of platemaking machinery.

French manufacturers such as Chambon compete in the still important market for letterpress printing equipment, and Creusot-Loire and Marinoni (a subsidiary of Harris, United States) play a major role in the market for offset presses. French sales of presses totaled $7.4 million in 1981. French companies are also successfully developing polymer platemaking equipment, with Rhone-Poulenc as a major supplier of both platemaking and photographic equipment.

The manufacturing activities of three U.S. subsidiaries in the Netherlands have expanded the Dutch share of imports. ATF Davidson is important for offset presses, Chemco for offset platemaking equipment, and Howson Algraphy for developing equipment.

Danish companies such as Eskofot, Glunz & Jensen, Hope Computer, and Luth International have been able to penetrate the market for developing machines and process cameras. In 1981, Danish firms sold photographic equipment valued at $1.3 million, for 6.5 percent of imports. Sweden is represented in the market for offset presses by GMA Bofors-Nohab and Solna Offset.

Japanese competition is found mainly in the photographic equipment market with Dainippon Screen contributing to Japan's 7-percent share of imports. Leading Japanese manufacturers of printing presses such as Fuji, Hamada Printing Press, Komori, and Ryobi, are represented in Italy and their advertising indicates an intention to gain a foothold in this market segment.

Domestic suppliers.—Italy has a very efficient and competitive printing equipment industry, comprising about 240 companies employing 103,000 workers; 8 companies account for half of total production. The industry concentrates heavily on presses and to a lesser degree on bookbinding equipment. Nine major companies manufacture efficient gravure, flexographic, sheet-fed offset, and screen printing presses that compare favorably with their European and American counterparts: Cerutti Giovanni Officine Meccaniche, Nebiolo, O.M.C.S.A., Officine Padane, Rotomec, Comat, Schiavi Cesare, Tecmo Tecnica Moderna, and Acigraf.

Domestic manufactures meet over half the printing industry's demand for bookbinding machinery, with Gandossi & Fossati and Smyth Europea Industrie as market leaders. Local producers do not offer the full range of photographic equipment needed by the graphics industry, but firms such as Durst offer sophisticated equipment, including electronic scanners. Phototypesetting equipment is manufactured by only one company, Simoncini Officine.

Manufacturers anticipate exporting approximately two-thirds of their presses and 45 percent of their bookbinding machinery in 1986. With increasing production of advanced phototypesetting equipment, exports of typemaking and typesetting machinery are forecast to more than double from $4.4 million to $10 million in the 1981-86 period. Exports of photographic equipment are also expected to rise at a healthy 11-percent yearly rate to $11 million, as the versatile domestic industry broadens its range of products. The printing equipment industry has a natural competitive advantage in supplying some important Latin American markets, in particular Argentina and Chile, where Italian immigrants and their descendants are key figures in the printing industry.

Local manufacturers benefit from labor costs that historically have been low compared to other industralized Western countries. They also enjoy a certain preference in government procurement procedures and, to some extent, in private sector purchasing decisions. However, this preference does not seriously impair U.S. sales, because U.S. and domestic companies usually supply different market segments.

Expenditures by Italian equipment makers on R&D are modest. Most companies prefer to make a profit by producing and selling machines with proven techniques at competitive prices. The industry's policy is to market trouble-free inexpensive equipment—not necessarily reaching the latest standards, but rendering reliable service to its customers.

The Printing Industry

Studies by the Italian printing industry indicate that the market for printed matter will grow at a faster pace than GNP, with sales rising from $8.8 billion in 1981 to $12 billion in 1986 (see table 4). Prepacking of food is still at a relatively low level

Table 4.—Italy: Sales, number of firms, and number of employees of the printing industry 1978, 1981, and 1986

	Sales (US$ millions)			Number of firms			Number of employees		
	1978	1981	1986	1978	1981	1986	1978	1981	1986
Newspapers	450	660	1,150	110	100	90	7,500	7,300	7,300
Magazines	910	1,430	1,900	500	450	450	8,000	7,800	7,800
Books	620	1,010	1,350	500	500	460	5,600	5,600	5,500
Commercial printing	1,920	2,800	3,400	5,140	4,250	4,100	37,300	36,900	36,000
Business forms printing	900	1,450	2,050	2,400	2,500	2,500	19,700	19,600	18,800
Printing for packaging	600	970	1,430	1,150	1,200	1,250	5,100	5,500	5,600
Service industries for the printing trade	170	300	470	550	600	650	2,300	2,400	2,500
Other printing	130	180	250	700	800	700	8,500	8,400	8,000
Total	5,700	8,800	12,000	11,050	10,400	10,200	94,000	93,500	91,500

Source: See source notation of table 1.

but is forecast to increase with the growth of self-service retail stores and the rising use of convenience foods. The fast-growing number of secondary and college students is stimulating the need for textbooks, and efforts to rationalize administrative work are expected to generate more demand for business forms and other printed matter. The Italian printers' association works hard to promote foreign sales, and the industry has become a net exporter of printed matter by a wide margin. In 1980, exports totaled $537 million compared with imports of $114 million. The major export items are books (32 percent of the total value) and periodicals/magazines (28 percent).

Labor costs amounted to about 45 percent of production costs in 1979. With a shortage of skilled craftsmen, the labor unions are able to press their demands for a continuation of the automatic cost-of-living adjustment in wages (scala mobile), further increases in basic wages, and stabilization of employment. The unions are strong in the printing industry, and their objections to the use of computerized techniques contribute to low productivity. Publishers complain that a web-fed offset machine with four printing units needs eight operators, while in most other Western European countries the job is done by four workers. On the other hand, the unions' high wage claims also encourage printers to invest in laborsaving machines to keep costs under control, and the number of employees in the industry is forecast to drop from 93,500 in 1981 to 91,500 in 1986.

A special national institute has been created to supervise 25 schools and institutes for vocational training in graphic arts and phototypesetting techniques. These schools are training 4,000 to 5,000 students, with 1,000 to 1,500 graduating annually. In addition, four technical institutes provide 5-year training courses for "experts" in graphic arts. About 1,500 to 2,000 students are enrolled, with 200 graduating yearly. Six schools are provided with special equipment to teach advanced phototypesetting techniques.

Since Italy is a member of the Common Market and follows a liberal trade policy, the printing industry has access to all needed materials. Domestically, inks, chemicals, films, and polymer and other printing plates are in sufficient supply. Paper, however, is more expensive in Italy than in other European countries because of the shortage of timber.

Neither air pollution regulations nor their implementation are very strict in Italy compared with other European countries. In other legislation, the parliament passed a 1981 law providing direct subsidies to publishers because the prices of many printed products (such as newspapers and textbooks) are fixed by law. These subsidies are expected to favor mainly medium-sized plants.

Newspaper printing.—Italian newspaper publishers are caught between fixed prices and spiraling production costs. All government efforts to subsidize the industry have failed so far, and most papers are viable only because of financial assistance from industrial groups or political parties. Advertising accounted for about 55 percent of revenue in 1980 and the trend is toward increasing this share. However, with legislation envisaged for free market prices by 1985, newspaper publishers look forward to increasing sales from $660 million in 1981 to more than $1 billion in 1986.

Capital expenditures are similarly forecast to rise from $34 million in 1981 to $54 million in 1986 as publishers modernize their plants and increase their productivity (see table 5). Purchases of graphic industries equipment are forecast to climb at a strong 10.4-percent annual rate to a 1986 level of $38.5 million.

Demand in the newspaper sector is expected to center on phototypesetting equipment: in particular, multistation copy entry systems and VDT's for editors, high-performance rotary offset presses for the setting of ads, and high-speed collating, folding, and bundling equipment for general usage. Multistation copy entry systems are well suited for daily newspapers that cover large regions of the country and try to give their readers the latest local news. Multistation systems with remote entry and dialogue capabilities are excellent tools for the many local editors who have to transmit last-minute reports to their central editing offices.

Conversion to offset printing in small and medium-sized newspaper printing plants has progressed rapidly, but a need still exists for advanced large rotary offset presses. Some of the largest newspapers, such as the Corriere della Sera, are still printed on letterpress equipment.

With the changeover to large rotary offset printing plants, materials handling equipment becomes ever more important. Automated web changers that avoid any interruption in the printing process are expected to be in demand as are sophisticated packaging, bundling, and conveying equipment to deal with the output of the high-speed presses.

Magazine printing.—Italian demand for general interest magazines is high, and the magazine sector is prolific, with 3,500 different weekly, bi-weekly, and monthly publications in 1981 (see table 6). In 1981, circulation of the weekly and monthly publications totaled 20 million and 27.5 million, respectively, while 11 million copies of the bi-weeklies were distributed. Sales are projected to increase from $1.4 billion in 1981 to almost $2 billion in 1986; about 60 percent of revenues comes from advertising.

Table 5.—Italy: Capital expenditures and purchases of graphic industries equipment by major user sectors, 1981 and 1986

(in millions of U.S. dollars)

	Capital expenditures		Purchases of graphic industries equipment	
	1981	1986	1981	1986
Newspaper printing	34.0	54.0	23.5	38.5
Magazine printing	62.0	85.0	44.5	60.0
Book printing	47.0	61.5	30.5	74.5
Commercial printing	78.0	107.0	56.5	40.0
Business forms printing	59.0	86.0	45.5	68.5
Printing for packaging	31.5	53.0	25.5	42.5
Government printing	6.5	10.5	5.0	8.0
Service industries for the printing trade	27.5	44.0	22.5	36.0
In-plant printing	16.0	26.5	14.5	24.0
Other publishing and printing	8.5	12.5	7.0	10.0
Total	370.0	540.0	275.0	402.0

Source: See source notation of table 1.

Table 6.—Italy: Production of books, newspapers, and magazines, 1981 and 1986

	Number of titles		Circulation (in millions)	
	1981	1986	1981	1986
Books				
Hardbound	10,000	12,500	80.0	95.0
Paperbound	9,000	11,500	90.0	115.0
Newspapers				
Daily	120	100	7.5	8.0
Weekly	25	25	2.5	2.8
Magazines				
Weekly	500	600	20.0	22.0
Bi-weekly	2,500	2,800	11.0	11.5
Monthly	500	600	27.5	25.0

Source: See source notation of table 1.

Gravure presses were used for 60-65 percent of magazine printing in 1981 (see table 7), and little change is expected for the future. Italy's large circulation, high-quality magazines are ideally suited for this technique. Multicolor offset printing presses are also expected to be in demand.

Capital expenditures are forecast to grow from $62 million to $85 million annually between 1981 and 1986. Purchases of new graphics industries equipment are expected to reach $60 million in 1986, a steady 6-percent yearly increase. In the prepress area, demand is forecast for high-speed phototypesetting units, equipment for the electronic preparation of gravure cylinders, and multistation copy entry systems. Increased use is also anticipated for sophisticated color separation scanners and process cameras.

The magazine sector sees substantial savings to be made in binding and finishing operations, including packaging. Many plants will be buying papercutting, collating, and stitching lines and packaging systems, including bundling and tunnel shrinking.

Book printing.—Book publishers are facing economic difficulties and foresee only a slow growth in sales, from $1 billion in 1981 to $1.35 billion in 1986. Textbook prices are fixed by the Government, and demand for mass consumption titles and scientific books is restrained by consumers' decreasing disposable income and by the limited funds of public libraries. Sales of books are also limited by the relatively high prices that result from small circulations. As a result, capital expenditures are projected to rise at a modest 5.5-percent annual rate to $61.5 million in 1986, of which $40 million is planned for new equipment purchases.

Approximately 450 of the 500 book publishers are small firms; only 15 companies have over 100 employees (see table 8). The eight leading publishing houses account for 61 percent of total production. The large enterprises resort to rationalization of book production by phototypesetting, offset printing, and advanced bookbinding lines. Tailor-made flexible solutions are in demand for the problems of integrating book printing and binding systems. The smaller book publishers are also trying to modernize production methods by acquiring direct entry phototypesetting systems and sheet-fed offset presses. Full-page composition equipment is used mostly for printing scientific books.

Commercial printing.—Commercial printing, the largest end-user with nearly 37,000 employees in 1981, is economically stable, with sales projected to escalate from $2.8 billion in 1981 to $3.4 billion in 1986. Of the approximately 4,250 commercial printers in 1981, 40 were of sufficient size to employ over 100 workers, 200 hired between 20 and 100 workers, and over 4,000 were smaller operators. The latter, neighborhood printers who work for local businesses and private individuals, are considered strong and also benefit from the contract work they receive from large establishments during peak work periods.

The commercial printing sector is very heterogeneous, with some of the most modern establishments as well as thousands of self-employed printers. Their total capital expenditures are forecast to climb from $78 million in 1981 to $107 million in 1986; purchases of equipment are projected to total almost $75 million in 1986, the largest of any sector in the printing industry.

Offset printing, now used for 60-65 percent of the work, clearly dominates the sector, although in southern Italy hot metal typesetting and flat-bed printing are still widespread. In most of the country, direct entry phototypesetting units are becoming standard, and the large companies use advanced phototypesetting equipment with CRT output. Printers are also buying peripherals for phototypesetting systems, color separation scanners, process cameras, sheet-fed offset presses, and cost-efficient sorting, collating, and binding equipment suitable for small runs.

Business forms printing.—Sales of printed business forms are forecast to reach more than $2 billion in 1986, a strong 7-percent yearly increase, in response both to growing bureaucracy and to attempts to rationalize that bureaucracy in the business and public sectors. Sales increases are expected for both continuous and other business forms. With increased demand, purchases of new graphics industries equipment are projected to climb at a rapid 8.5-percent annual rate to close to $69 million in 1986.

Items expected to be in demand include offset printing and platemaking equipment. Business forms printers especially appreciate the cost efficiency of web-fed offset presses. Sales prospects are also good for special printing equipment for continuous business forms, carbon paper forms, and OCR readable forms. Demand for phototypesetting equipment is expected to rise as offset printing grows.

Printing for packaging.—Package printing is one of the few industry sectors projecting increased employment for 1986, in response to demands for more and better quality packaging. Many foodstuffs are still sold unpackaged in retail shops, but with the predicted growth of self-service retailing, the need for prepackaged products is expected to rise. Consumption of deep-frozen and other convenience foods is also expected to increase from the present low levels.

The Italian consumer likes colorful packaging, thus the increased need for multicolor printing equipment. Demand for attractive and expensive package printing is also stimulated by the food and beverages industry, which is creating more national and

Table 7.—Italy: Type of printing process as percentage of total dollar volume of printing, by end-user sector, 1981 and 1986

	Letterpress		Offset-Lithography		Gravure		Screen		Total
	1981	1986	1981	1986	1981	1986	1981	1986	
Newspaper printing	35-40	30-35	55-60	60-65	0- 5	0- 5	—	—	100
Magazine printing	15-20	15-20	15-20	15-20	60-65	60-65	0- 5	0- 5	100
Book printing	30-35	25-30	50-55	55-60	5-10	5-10	0- 5	0- 5	100
Commercial printing	20-25	20-25	60-65	60-65	5-10	5-10	—	—	100
Business forms printing	35-40	30-35	50-55	55-60	5-10	5-10	—	—	100
Printing for packaging	10-15	10-15	25-30	25-30	40-50	40-50	15-20	15-20	100
Government printing	30-35	25-30	50-55	55-60	15-20	15-20	0- 5	0- 5	100
In-plant printing	25-30	20-25	60-65	65-70	5-10	5-10	0- 5	0- 5	100
Other printing	50-60	40-50	30-35	40-50	10-15	10-15	0- 5	0- 5	100

Source: See source notation of table 1.

Table 8.—Italy: Number of firms by size in the printing industry sectors, 1981

	Number of firms			
	Large (100+) employees	Medium (20-100) employees	Small (less than 20) employees	Total
Newspaper printing	15	30	55	100
Magazine printing	15	100	335	450
Book printing	15	35	450	500
Commercial printing	40	200	4,010	4,250
Manifold or continuous business forms printing	5	95	2,400	2,500
Printing for packaging	5	125	1,070	1,200
Government printing	2	18	280	300
Service Industries for the printing trade	3	47	550	600
In-plant printing	—	50	450	500
Other printing	—	50	750	800
Total	100	750	10,350	11,200

Source: See source notation of table 1.

export brands. In response, the sector's purchases of new graphic equipment are predicted to climb dramatically at almost 11 percent a year to a 1986 level of nearly $43 million.

Demand is expected to center on flexographic and gravure presses. Screen printing is also used for 15-20 percent of the work and is forecast to maintain that level. Special presses for printing of corrugated cardboard are also needed. Italian package printers prefer machines designed to minimize production losses from misprints or other defects.

In the past, package printing machines have been largely supplied by Italian manufacturers. With more complicated printing methods, more users are looking to the specialized imported machines necessary to print frozen food packages, glass bottles, and aluminum foils.

Government printing.—The equipment used in the various government printing plants is largely obsolete but the Government's austerity policy makes the needed replacements unlikely. Purchases of new equipment in 1986 are projected to reach only $8 million. The largest government printing plant, the Instituto Poligrafico dello Stato, has acquired some gravure and offset presses, but upgrading is still needed. In the approximately 300 small and medium-sized government printing plants, modernization proceeds very slowly. Purchases are expected to center on small sheet-fed offset presses, simple bookbinding equipment and offset platemaking equipment.

Service industries for the printing trade.—Service industries for the printing trade are fast expanding, with sales forecast to jump from $300 million in 1981 to $470 million in 1986, over 9 percent a year. The conventional lithographic platemaking shops are losing importance, but service shops with the latest machinery are becoming essential to many small and medium-sized print shops that cannot afford to invest in costly color separation scanners or computerized phototypesetting equipment. The service bureaus also use or sell software, often developed themselves. The sector's equipment purchases, forecast to hit $36 million in 1986, are expected to focus on advanced phototypesetting and other prepress equipment, including top performance computerized systems, devices for the electronic preparation of gravure cylinders, and process cameras. Service companies specializing in bookbinding are also expected to be significant purchasers of equipment.

In-plant printing shops.—In-plant printing is clearly on the upswing. The cost-efficient printing systems now offered entice many businesses to upgrade their duplication equipment by acquiring small-format offset presses, usually sheet-fed. Growth rates in the demand for new printing equipment, projected at 10.6 percent yearly between 1981 and 1986, are limited to some extent by the poor financial shape of many Italian companies at the present time. The availability of high-quality inexpensive photocopiers also creates competition for printing equipment, but in the long run sales of small offset presses are not expected to be impaired by those of copying devices. In addition to offset presses, the anticipated $24 million in new equipment purchases for 1986 is expected to center on typesetting and platemaking equipment and inexpensive bookbinding machinery for small and medium-sized jobs.

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U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The market for telecommunications equipment in Italy is expected to grow steadily from $1.5 billion[1] in 1981 to almost $2 billion in 1986 as the public continues to demand more and better telecommunications services (see table 1). Half the families are still without telephones, and the lengthy waiting lists have not been reduced significantly in recent years. Those with service are far from satisfied—premium lines, available only on a rental basis, consist of regular lines with add-on devices such as amplifiers and equalizers. Business subscribers also complain about the lack of a dedicated public data communications network; many resort to in-house communications systems, but they must still deal with the constraints of the public network and the obstacles imposed by the franchised telephone companies (Societa Italiana per l'Esercizio Telefonico—SIP and Azienda di Stato per i Servizi Telefonici—ASST) and the Posts and Telecommunications (PT) Administration.

Competitive Environment

In 1981, almost 87 percent of the telecommunications equipment market was supplied by local producers, a situation not likely to change in the near future. Complex government regulations, as well as national tradition, favor companies with manufacturing operations in Italy. The five major suppliers—three of them multinational corporations with Italian factories—work closely with the major buyers, all either franchised or controlled by the Government. Italtel, part of the holding company STET (Societa Torinese Esercizi Telefonici), accounts for about 40 percent of domestic output. Face Finanziaria, a subsidiary of International Telephone & Telegraph, United States, provides around 23 percent. GTE (Italy) of General Telephone & Electronics, United States; Setemer (L.M. Ericsson, Sweden); and Telettra, a subsidiary of FIAT, each accounts for about 12 percent.

A substantial portion of imports comprises parts, as multinationals exchange finished or semifinished products with allied manufacturers in other countries. This practice explains the relatively low R&D level of the Italian telecommunications industry.

U.S. producers captured about 15 percent of the import market during the 1978-81 period (see table 2). They can look forward to good sales opportunities in the growing markets for digital private automatic branch exchanges (PABX), facsimile machines, encrypters, high-speed modems and statistical multiplexers, and technologically advanced products that are not yet manufactured locally.

German firms led third-country vendors with 24 percent of imports in 1981, reflecting ties between Siemens AG and Italtel, which operates largely under license from the German company. German sales are primarily in the telephone, telex, and transmission equipment segments. Swedish and U.K. manufacturers provided 11 and 7 percent, respectively, of 1981 imports. Japanese companies have been able to capture 8 percent of the market without establishing manufacturing operations in Italy or elsewhere in Europe. Their sales of video/radio broadcasting and portable mobile radio equipment to the private sector allow them to circumvent the official buy-Italian position.

Product Market Profiles

Telephone and telex equipment.—Sales of telephone and telex equipment totaled more than $1 billion in 1980 and are forecast to reach $1.3 billion in 1986 as electromechanical equipment is gradually replaced with electronic digital systems. Sales of switches and switching systems reached $674 million in 1980 (see table 3), but this total was abnormally low because SIP, the largest buyer, substantially reduced investments. To satisfy demand, 129,000 existing customer loop attachments were activated, and only 741,000 new ones were installed in local offces. Toll office junctions also showed low sales in 1980, with SIP purchasing only 49,500 toll junctions instead of the optimal 60,000. By 1986, the number of annual installations is expected to approach 1.1 million local office attachments and 75,000 toll office junctions.

A semi-electronic analog switching system introduced as a stop-gap measure and now accounting for 20 percent of all new toll office junctions will be phased out in 1984. The first digital local office systems (small, U.S.-developed Proteo models) were installed in 1980, and continuing installation of digital equipment is planned to bypass entirely the analog electronic step. The choice of future technology, still undefined, will be influenced by a cooperative agreement between GTE and Italtel. How-

Source: "Communications Equipment—Italy," J.B.A.—Foro Buonaparte 48—Milano, Italy, February 1982, performed under contract to International Trade Administration, Office of Trade Information Services (see Additional Information box) and desk research.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1=849.44 Lira (1978), 833.13 Lira (1979), 845.55 Lira (1980), and 1,102.64 Lira (1981). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

Table 1.—Italy: The market for telecommunications equipment, 1978-81 and projected 1986

(in millions of U.S. dollars)

	1978	1979	1980	1981	Projected 1986
Telephone and telex equipment					
Local production	850.9	972.3	1,019.7	1,026.2	1,300
Imports	68.0	88.1	120.3	103.8	130
Export (less)	81.9	87.0	119.3	99.8	125
Total	837.0	973.4	1,020.7	1,030.2	1,305
Transmission equipment					
Local production	345.5	424.4	509.5	410.2	565
Imports	26.4	32.9	40.7	39.7	45
Export (less)	105.9	87.7	124.1	101.6	160
Total	266.0	369.6	426.1	348.3	450
Mobile radio					
Local production	9.0	13.4	18.6	12.9	20
Imports	9.8	12.4	15.6	14.3	20
Export (less)	—	—	.2	—	—
Total	18.8	25.8	34.0	27.2	40
Video and radio broadcasting equipment					
Local production	25.1	31.5	31.5	30.4	30
Imports	27.6	38.7	49.4	22.7	35
Export (less)	2.0	5.4	5.2	4.1	5
Total	50.7	64.8	75.7	49.0	60
Data comunications equipment					
Local production	13.9	18.4	28.3	23.6	65
Imports	9.1	12.2	9.6	14.1	20
Export (less)	.6	.6	1.2	.9	5
Total	22.4	30.0	36.7	36.8	80
Total market					
Local production	1,244.4	1,460.1	1,607.5	1,503.2	1,985
Imports	141.0	184.3	235.6	194.6	250
Export (less)	190.5	180.6	250.1	206.3	290
Total	1,194.9	1,463.9	1,593.0	1,491.5	1,945

Source: International Trade Administration, Office of Trade Information Services research study, "The Market for Communications Equipment—Italy" (see Additional Information box).

ever, Fatme's (a division of Setemer/Ericsson) AXE and Face's 1240 systems will be tested; the latter is scheduled for installation in Bologna in 1984 to establish the feasibility of the Integrated Services Digital Network (ISDN) concept. By comparison, digital technology will be introduced more quickly in toll offices, where 88 percent of such junctions will be installed in 1986.

U.S. technology is the basis for much of Italy's telecommunications industry, but production is done locally under license. Italtel, Face, Fatme, and GTE produce local and toll office market, with Italtel supplying nearly half the market. However, the market's structure may change as the Government tries to reduce the number of different switching technologies from five to two or three.

Sales of subscriber/user premises equipment totaled $279 million in 1980. Telephone sets and many other products in this category are purchased by SIP and rented to subscribers. Until public services began, facsimile machines were customer-owned. PABX's are 50-percent owned by their users and key and answering systems 10-15-percent owned.

Pushbutton telephones will rapidly increase in popularity, with this model accounting for 20 percent of new telephone set sales in 1986. The pushbutton model now being manufactured, however, is not the touch-tone, multifrequency unit familiar in the United States, but a set that incorporates a digital keyboard and converter to perform the dialing as in a conventional rotary set. The first models of magnetic-card pay phones are already installed. Urmet maintains a near monopoly in coin/token-operated phones. Answering machines, automatic dialers, call restrictors, and similar products are usually supplied

Table 2.—Italy: Imports of telecommunications equipment by country of origin, 1978-1981 and projected 1986

(in millions of U.S. dollars)

	1978	1979	1980	1981	Projected 1986
Telephone and telex equipment					
United States	3.81	12.95	15.10	13.12	15.2
Germany	18.44	30.94	38.25	29.05	
Sweden	9.10	14.75	23.03	20.86	
Belgium	8.05	6.26	6.41	7.07	
United Kingdom	2.85	4.74	5.60	5.14	
Other	10.14	18.49	31.90	28.58	
Total	52.39	88.13	120.29	103.82	128.8
Transmission equipment					
United States	4.79	8.61	8.34	8.65	10.2
Germany	5.59	7.62	8.11	8.55	
United Kingdom	2.53	5.21	2.96	3.39	
Belgium	.15	.32	3.44	3.25	
France	1.52	2.46	1.92	1.80	
Other	5.80	8.70	15.99	14.03	
Total	20.38	32.92	40.76	39.67	44.6
Mobile radio					
United States	2.90	4.24	2.61	3.54	5.8
Japan	.97	1.77	4.47	3.93	
United Kingdom	.50	.50	1.28	1.43	
Germany	.76	1.01	.93	.94	
France	.49	.75	.40	.16	
Other	1.95	4.13	5.94	4.33	
Total	7.57	12.40	15.63	14.33	20.3
Video and radio broadcasting equipment					
United States	2.30	3.80	6.32	2.78	3.9
Japan	7.08	11.96	18.52	11.12	
United Kingdom	4.22	7.26	5.80	2.72	
Germany	3.00	8.47	5.37	1.05	
France	.69	1.83	3.25	.50	
Other	3.98	5.39	10.10	4.50	
Total	21.27	38.71	49.36	22.67	34.7
Data communications equipment					
United States	.90	.98	1.14	1.03	3.1
Germany	5.10	9.54	5.74	6.32	
France	.03	.25	.64	1.51	
United Kingdom	.38	.91	.88	.30	
Netherlands	.28	.04	—	—	
Other	.33	.46	1.18	4.92	
Total	7.02	12.18	9.58	14.08	20.9

Source: Statistica Mensile Commercio con l'Estero, Dicembre 1978, 1979, 1980; Agosto 1981.

by tiny companies like Gnecchi/ITT, Sime Brondi, and Ansafone, all Italian firms, and Zettler (Switzerland). Encrypter manufacturers with knowledge of security problems stand to profit from the expected gradual acceptance of telecommunications security devices, now restricted almost solely to oil company use.

The 1980 facsimile market consisted of approximately 4,000 units, excluding special-purpose newspaper machines. In 1980, the PT Administration introduced a public facsimile system in 10 cities. SIP's aggressive marketing program includes offering its own facsimile service, the Telecopier, with high-speed, group II machines rented to users. The projected 1986 facsimile market includes the even higher speed group III machines and is one of few areas offering sales potential to U.S. firms. Leading suppliers of facsimile machines are Minnesota Mining & Manufacturing (3M) and Xerox (both U.S. firms), Italtel/Hell-Siemens, and Muirhead (United

Kingdom), which supplies the newspaper industry. All major facsimile suppliers are active in Italy, however.

Digital technology came to the PABX market in 1980. The American time-division multiplexing (TDM) approach seems to be preferred to the European space-division multiplexing (SDM). In 1980, SIP purchased 5,560 PABX's for 171,491 extensions at an initial cost of $78 million, with expansions increasing that amount by $20 million. Ten to 15 percent of the 1980 models were electronic and larger than earlier versions. In 1979, only 441 new manual PBX's were installed for 22,775 extensions. The four major suppliers of switching equipment also sell PABX's, but their market shares are reduced considerably by stiff competition from International Business Machines (IBM-United States), Philips (Netherlands), Telic (France), Telenorma (Germany), and Northern Telecom (Canada)/Olivetti (Italy). Italtel's 58-percent share of the 1980 PABX market represented a decline.

Table 3.—Italy: The market for telecommunications equipment and systems by product category, 1980 and projected 1986

(in millions of U.S. dollars)

	1980	Projected 1986
Telephone and telex equipment		
Switches and switching equipment	674.12	937.7
Subscriber/user premises equipment	279.46	300.2
Telex equipment	67.06	67.1
Category total	1,020.64	1,305.0
Transmission equipment		
Wire and cable	182.13	222.2
High frequency radio	3.55	—
Microwave	34.30	40.8
Lightwave (fiber-kilometer)	1.54	6.0
Multiplexers (except data)	204.60	184.1
Category total	426.12	453.1
Mobile radio		
Conventional mobile radio	21.88	30.7
Mobile telephones	4.38	2.9
Marine	2.37	2.8
Paging systems	2.37	1.3
Air-ground	2.96	3.3
Category total	33.96	41.0
Video and radio broadcasting equipment		
Closed circuit television	17.74	14.5
Radio broadcast transmitters	3.19	4.5
Television broadcast transmitters	20.70	15.4
Antenna towers	1.77	.7
Radio studio equipment	3.31	5.4
Video studio equipment	28.98	20.9
Category total	75.69	61.4
Data communications/equipment		
Concentrators/multiplexers	3.55	13.6
Modems	29.57	49.0
Data communications/switching equipment	2.37	13.2
Other equipment	1.18	6.8
Category total	36.67	82.6

Source: International Trade Administration, Office of Trade Information Services research study, "The Market for Communications Equipment—Italy."

Electronic key systems are also being introduced rapidly and tend to overlap PABX's low end. The general trend for PABX and key systems is toward more sophisticated, multifunction sets incorporating memory, automatic dialing, and call restriction—features currently provided by add-on equipment. SIP has already approached two local manufacturers and hopes to test market the first units in the near future. Safnat earned 64 percent of the key systems market in 1980, trailed by Italtel, Face, and GTE.

SIP's purchases of outside plant cable accessories are included in figures on switches and switching equipment, the latter including signaling. ASST, another major end-user, buys signaling separately and in 1980 purchased about 20,000 centrally programed and 2,700 individually programed units. The market for splices is minimal because most cables are still spliced manually, with general-purpose tools. Leading suppliers of outside plant cable accessories are 3M for cable-blocking material; Nicotra (Italy-under U.S. license), Puregas (United States), and Lancer (Germany) for air dryers; and Raychem (United States) for heat-shrinking splice closures.

Seventy percent of the $67 million in telex equipment sales in 1980 was attributed to the PT Administration's purchase of 11,000 teleprinters for public rental. New telex lines, half of which were electronic, numbered 5,300. Telex modernization is currently underway and involves two electronic switching centers utilizing Siemens' EDS technology as well as substantial teleprinter replacement. A few small Olivetti message-switching machines will be in place in the near future. Although current telex alphabet is CCITT N.2, a change to N.5 is being considered, since it provides more control and command keys. Telex subscriptions are expected to increase at 18 percent a year until 1985 and then drop to 9 to 10 percent; expansion plans do not therefore extend beyond 1986. Italtel and Olivetti have virtual monopolies for telex switching equipment and teleprinters, respectively.

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Telephone and telex equipment		
Ansafone	Italy	Answering machines, automatic dialers, call restrictors
Fatme	Italy	AXE system
Face Finanziaria	Italy	AXE system, key systems, telephone multiplexers
Face Sud	Italy	Packet switching equipment
Gnecchi	Italy	Answering machines, automatic dialers, call restrictors
Italtel	Italy	Telex switching equipment, teleprinters, key systems, telephone multiplexers, packet switching equipment, facsimile machines
Olivetti	Italy	Telex switching equipment, teleprinters
Safnat	Italy	Key systems
Selenia	Italy	Telephone multiplexers
Telettra	Italy	Telephone multiplexers
Urmet	Italy	Coin/token operated phones
Dex-Burroughs	United States	Facsimile machines
GTE	United States	Key systems, telephone multiplexers
IBM	United States	Switching equipment
ITT	United States	Facsimile machines
3 M	United States	Facsimile machines, cable blocking material
Nicotra	United States	Air dryers
Puregas	United States	Air dryers
Raychem	United States	Heat-shrinking splice closures
Xerox	United States	Facsimile machines
Hitachi	Japan	Facsimile machines
Kalle/Ricoh	Japan	Facsimile machines
Lancer	Germany	Air dryers
Marconi	United Kingdom	Telephone multiplexers
Northern Telecom	Canada	Switching equipment
Philips	Netherlands	Switching equipment, facsimile machines
Siemens	Germany	Telex
Sime Bondi		Answering machines, automatic dialers, call restrictors
Telec	France	Switching equipment
Telenorma	Germany	Switching equipment
Tran-DNE	Switzerland	Small packet switching networks
Zettler	Italy	Answering machines, automatic dialers, call restrictors
Transmission equipment		
Face Finanziaria/ITT	Italy	Microwave
Hewlett Packard Italiana	Italy	FDM, PCM transmission analyzers, broadcast analog instruments microwave analyzers and data and voice-data analysis instruments transmission
Italtel	Italy	Microwave
Pirelli	Italy	Optical fibers
SIRTI	Italy	Optical fibers
Selenia	Italy	Microwave
Tektronix Italiana	Italy	Scope-based instruments
Telettra	Italy	Microwave transmission
Alcyon	United States	Data transmission
Hekimian Laboratories	United States	Voice-data analog transmission
Spectron	United States	Data transmission
Marconi	United Kingdom	Microwave, voice-data analog transmission, FDM/PCM transmission
Siemens	Germany	Voice-data analog transmission, FDM/PCM multiplex radio links, FDM/PCM transmission
Tekelec	France	Voice-data analog transmission, FDM/PCM transmission
Wandell & Galtermann	Germany	Voice-data analog transmission, FDM/PCM multiplexed radio link analyzers and broadcast instrumentation.

Leading Suppliers—Continued

Name	Country(ies) of Manufacture	Type of Equipment
Mobile radio equipment		
Elit Elettronica Italiana	Italy	Sideband analyzer
Italtel	Italy	Mobile telephones
OTE	Italy	Ground installations for air-ground communications
Prodel	Italy	Mobile radio systems
SIAE	Italy	Mobile radio systems
Bosch	Germany	Mobile radio systems
Philips-Pye	United Kingdom	Mobile radio systems
Standard	Japan	Portable unit
Storno	Denmark	Mobile radio systems
Yaesu	Japan	Portable unit
Video and radio broadcasting equipment		
Azeta	Italy	Audio studio equipment
BLT	Italy	Scan converters
Elpro	Italy	Low-power transmitters
Inelco/Zanussi	Italy	CCTV equipment
Irte	Italy	Low-power transmitters
Itelco	Italy	Low-power transmitters
Magneti Marelli	Italy	CCTV equipment
Sero	Italy	Low-power transmitters
Tem	Italy	Low-power transmitters
AIL	United States	Broadcast instrumentation
Ampex	United States	Video studio equipment
Grass Valley	United States	Video studio mixers
RCA	United States	Video studio equipment
Telonics	United States	Broadcast instrumentation
Hitachi	Japan	Video studio equipment
Ikegami	Japan	Video studio equipment
NEC	Japan	VTR
Philips	Netherlands	Broadcast instrumentation
Rhode & Schwarz	Germany	Broadcast instrumentation
Siemens	Germany	Broadcast instrumentation
Sony	Japan	Video studio equipment, mobile van equipment
Data communications equipment		
AET	Italy	Modems
Are	Italy	Modems
Italtel	Italy	Modems
Codex	United States	High speed modems,, statistical multiplexers, and security equipment
IBM	United States	Modems and concentrators
Micom	United States	Statistical multiplexers, and data concentrators
Prentice	United States	Acoutic couplers
Racal Milgo	United States	High speed modems statistical multiplexers, and security equipment
Philips	Netherlands	Modems

Several new telephone and telex services have received experimental attention. The PT Administration provided SIP with a budget of $4.5 million to test market Videotex in six large cities, offering the service to approximately 1,200 users. Tests of the U.K.-developed system were to begin in 1982. Teletex, an electronic mail system, was being tested also in 1982. Additional new services with potential are slow-scan video (Videolento) for road traffic control, teleconferencing (audio first, video later), and telediagnosis (electrocardiogram).

Transmission equipment.—Transmission equipment sales decreased from $486 million in 1980 to $348 million in 1981 when SIP curtailed investments, but are expected to reach $453 million in 1986. According to 10-year projections used in Italy's National Telecommunications Plan, the number of telephone circuits will be doubled between 1980 and 1990 in a straight line trend.

Demand for U.S.-made products focuses on technologically advanced items that are not yet manufactured locally, which often are purchased for evaluation purposes. In the PT market segment, good opportunities exist in optical fiber equipment: short term for the fiber itself, long term for ancillary equipment. In the non-PT segment, industry sources have expressed interest in metallic trunks, analog carriers, buried paired cables, FDM multiplexers, analog microwave links, and special antennas. A small and apparently unexploited market exists for portable microwave links for data communications capable of performing underground over a 1-2 km stretch.

Approximately half the transmission equipment bought in 1986 will be wire and cable, with sales of paired cables for local and long-distance networks showing particular growth. SIP, ASST, Italcable, PT Telegraph Services, and Telespazio are the major buyers and have established long-lasting relationships with many domestic equipment suppliers. Pirelli and its Alfcavi subsidiary furnish 55 percent of the paired cables and more than 60 percent of the coaxial cables. CEAT and Fulgor Cavi account for much of the remainder of the market.

Increasing interest is developing in COS's (Cavo Ottico Sperimentale) experiments testing the transmission performance of optical cables. ASST is due to complete the installation of a 35 km, 140 Mb/s optical cable between Padua and Mestre and, starting in 1983, SIP plans to monitor operations of five optical cable links, one for each zone, totaling 90 km. Following the experimental phase, sales of optical fibers should increase substantially and are expected to reach $6 million a year by 1986. Optical will begin replacing microcoaxial pairs after 1986 in local and distribution networks

The market for microwave equipment is forecast to total $41 million in 1986, as high-frequency apparatus is replaced with microwave equipment following the 1979 WARC recommendations; a further boost will come from the increasing use of radio links in local telephone networks, especially in the new polycentric areas.

Sales of multiplexers will continue despite inroads made by digital technology, as much of the network will still be analog at least until 1986. However, sales are projected to drop from $205 million in 1980 to $184 million in 1986.

The leading suppliers of multiplexers and microwave links show mixed strengths and weaknesses. Telettra had the greatest percentage of multiplexer installations in 1980, but Italtel had a far greater number of new orders. Marconi had a role in installations, but Selenia had many more new orders. In microwave, GTE narrowly claimed leadership in installations with a 44.8 percent market share to Telettra's 44.4 percent; however, GTE boasted 63 percent of new orders while Telettra could claim only 28.5 percent. Telettra and Autophon (which it controls), SIAE, Prodel, and Ponti Radio (all domestic firms) supply radio links to the non-PT market.

Long-distance transmission in Italy is predominantly frequency-division multiplex (FDM) analog. The percent of digital pulse-code modulation (PCM) calculated on a live circuit-km basis was 2.4 in 1980 and is expected to reach 10 percent by 1986, when 90 percent of all equipment purchased will probably be digital. ASST and SIP are both at work on higher speed transmission and digital systems, with preference going to systems and equipment that fit the existing analog network. ASST is experimenting with 140 Mb/s digital transmission on coaxial pairs between Rome and Naples with signal regeneration stations 2 km apart, so as to match the existing 12-MHz analoz system; the same speed is being tested on an 11-GHz radio link between Perugia and Rome. Under investigation is the feasibility of 565 Mb/s transmission on coaxial pairs, a digital solution equivalent to the 60 MHz analog one. SIP is testing digital, 960-channel, 70 Mb/s transmission on 7 and 11 GHz radio links; is developing with CSELT a dual-polarization parabolic antenna; and will soon begin experimenting with 140 Mb/s speeds on minicoaxial pairs. Concurrently, it is investigating radio links operating at 15 GHz for its sector network and at 19 GHz, 34 Mb/s for polycentric areas. In advanced development are inexpensive yet reliable PCM multiplexers and 2 Mb/s systems. Underway is a joint SIP/CSELT program to determine whether the existing network is adequate for a 2 Mb/s speed and whether 80 kb/s could be transferred over a single paired wire. The PT Administration is gradually replacing existing 24-channel FDM multiplexers with 46-channel TDM units in order to improve quality and increase capacity without touching the existing lines in the telex network.

Mobile radio.—The market for mobile radio equipment, which totaled $34 million in 1980, should grow to almost $41 million in 1986. Conventional mobile radio equipment accounted for about 64 percent of 1980's market; mobile telephones, for approximately 13 percent; air-ground communications (ground stations only), for about 9 percent; and paging systems and marine radio, half each of the remainder.

Current demand for conventional mobile radio is brisk, with fixed stations accounting for 16 percent of sales in 1980, while vehicular and personal units were responsible for 11 percent and 43 percent, respectively. Largest purchases of mobile radio systems are made by ENEL (Ente Nazionale per l'Energio Elettrica or "the electrical company"), ENI (Ente Nazionale Idrocarburi or "the gas company"), SIP, and other government agencies. Regional administrations are expected to place substantial orders in the future. Sophisticated buyers like these agencies usually purchase individual components and assemble the systems. Private buyers, however, typically choose turnkey systems.

Leaders in the conventional mobile radio systems market include Storno/GTE (Denmark), Philips-Pye (United Kingdom), Bosch (Germany), SIAE, and Prodel, each with about a 10-percent share. SIAE has complied with ENEL's specifications to become its sole supplier. Yaesu and Standard from Japan offer strength in the portable unit market segment. U.S. firms' chances in this area rest with their ability to compete with European suppliers of sophisticated mobile radios.

At the end of 1980, SIP's mobile telephone service had 2,000 subscribers, mostly in Rome and Milan. A limited availability of channels has precluded the systems's expansion to any more than 400-500 additional subscribers in Rome and Milan with 3,000 in other locations. For this reason, the PT Administration authorized SIP in 1980 to study a second-generation system to accept up to 40,000 subscribers; this system is unlikely to be operational until 1986, however. In 1980, SIP's purchase of mobile telephone's amounted to $3.8 million for 1,085 units and $600,000 for fixed stations and antennas. Allocations for $2.9 million in 1986 reflect expected purchases of only 600 more mobile units, since the fixed station network is already adequate. Italtel enjoys a virtual monopoly in the mobile telephone market because its holding company (STET) also controls SIP.

SIP currently offers a vehicular, tone-only paging service in seven areas, with about 600 subscribers as of late 1980. At that time, SIP was authorized to activate a tone-and-voice paging system ready since 1976. This system, called Teledrin, began operating with Motorola (United Kingdom/United States) Page Boy units in July 1981 in Rome and will gradually be extended to Milan, Turin, Genoa, Naples, and Palermo. The number of subscribers is forecast to reach 10,900 by 1986.

Italy has two coastal radio networks, one under the jurisdiction of the PT Administration, the other supervised by various port authorities reporting directly to the Ministry of Merchant Marine. The port authorities' network was completed around 1975 and will remain largely unchanged. The PT Administration, however, is likely to purchase five very high frequency (vhf) transceivers before 1986. Sales of outboard marine radios for 1980 were estimated at $1.7 million; imports accounted for about half. This market should experience a 5-percent annual growth rate. Scanti and Labes, both Italian firms, lead the market for marine radios.

The entire network of ground stations for air-ground communications is undergoing extensive revamping. The replacement program will be close to completion by 1986; only a tenth of 3,000 needed units have been bought thus far. OTE leads in sales to this market segment. Ground stations should offer sales opportunities after 1986 to U.S. suppliers in joint venture with Italian manufacturers.

Video and radio broadcasting equipment.—Total sales in 1981 approached $50 million, down from a record $75 million in 1980. The market is forecast to climb back to more than $60 million in 1986. Video studio equipment accounted for nearly 40 percent of the 1980 market; television broadcasting transmitters for around 27 percent; and closed circuit TV (CCTV) equipment (largely for security installations) for about 23 percent.

Radiotelevisione Italiana (RAI), the national broadcasting company, ranks as the largest single Italian buyer of broadcasting equipment and one of the telecommunications industry giants. In 1980, RAI completed its third nationwide TV channel and decentralized production to the regional level. A slight increase in RAI's investment budget is forecast in 1986 to introduce stereo TV and upgrade audio and video studios with digital equipment. New services being planned include Teletext, called Televideo by RAI, and broadcasts on the conventional channel of specialized information for selected users equipped with decoders. Satellite broadcast is being investigated by both RAI and the private networks, but its generalized use is not expected before 1986-87.

High-power transmitters are usually supplied to RAI by the world's leading manufacturers, including Rhode & Schwarz, Philips, and Marconi. SIAE and Itelco, domestic suppliers, sell to RAI as well. RAI buys equipment for mobile vans from Sony and video studio mixers from Grass Valley through its Italian representative Sylverstar.

By 1986, the private radio and TV sector is expected to undergo a major restructuring which will involve less but more sophisticated equipment. Video tape recorders (VTR's), especially light, portable units for newsgathering, sold well in 1980 and should continue to do so. Japanese companies, newcomers to the Italian market, are increasing their share rapidly with up-to-standards products at very competitive prices. Inelco/NEC, Hitachi, and National, all Japanese firms, lead the market for VTR's. Hitachi and Ikegami market video studio equipment through their Italian representatives Tecom Video Systems and Abbo Elettronica. Domestic suppliers of low-power transmitters for the private radio and TV market include Itelco, Irte, Sero, Elpro, and Tem. Semprini, Azeta, and Munter sell good quality audio studio equipment.

Opportunities for many U.S. producers are limited because their prices are out of reach of most private operators. Prospects do exist, however, for such sophisticated equipment as 1″ or 2″ reel-to-reel VTR's and broadcast turntables. Excellent opportunities may also exist for digital video studio equipment despite stiff price and technology competition from Japanese suppliers.

CCTV sales for production control monitoring were disappointing in 1980. However, the overall CCTV market is projected to remain static through 1986, helped by a growing interest in scan-converters that should compensate for declining interest in conventional systems. Volume will increase dramatically if insurance companies follow through on allowing rebates to clients with CCTV installations. More than 50 percent of CCTV equipment sales in 1980 were accounted for by Magneti Marelli, Inelco/Zanussi, and Philips. BLT, a small domestic firm, manufactures scan converters that are marketed by other companies under different labels.

Data communications equipment.—Total sales of data communications equipment amounted to $36.7 million in 1980 and a steady market increase to about $83 million is expected in 1986. Modems, which are generally rented by SIP to users, accounted for nearly 80 percent of the total in 1980. SIP's virtual monopoly in the data communications market has been challenged by the banking industry, and third parties can now buy freely if they pay SIP annual maintenance fees. Modem sales will remain high through 1986 to accommodate an increasing number of terminals attached to a predominantly analog network.

Higher speed modems, from 4,800 bits per second (bps) up, and expensive leased lines are expected to boost sales of multiplexers and other support equipment. Acoutic couplers, popular data communications products, have been introduced in the Italian market.

Sales potential is excellent for American data communications equipment and should remain so in the foreseeable future. Best opportunities are for high-speed modems and statistical multiplexers to reduce communications costs; high-speed acoustic couplers to provide inexpensive interface for small computers; and small packet switching stations to allow more efficient data communications in the absence of a high-quality public data network.

The data communications market is destined to change, with a public data network in the planning stage and a private market just beginning to materialize. In 1980, Italcable introduced DARDO (Direct Access to Remote Databases Overseas) using packet switching to access databases such as Tymnet and Telenet in the United States. Some private end users have also begun installation of their own packet switching networks.

Data communications traffic is not monitored currently because it is carried on switched or leased lines. Honeywell Information System Italia estimates the computer population at 39,800 units in 1981 and projects growth to 137,000 units in 1985 with the greatest increase occurring in the mini/micro segment. Private users' demand for data communications equipment is expected to increase rapidly in the short terms but to slow down by 1986 with the availability of public switched data networks. Three large packet switching systems and 20 small concentrators for data have been ordered by SIP and the PT Administration and should be operational by 1984.

Public sector managers have set an ambitious target: an operating ISDN system by 1990, with an intermediate step by 1984—dedicated data networks based on packet switching technology and integrated with a circuit switching system at a lower level. A circuit switching stopgap is a voice-data network currently undergoing technical tests and is, in reality, a compromise between 64 kpbs transmission and analog switching. Major end-users are increasingly interested in local data communications networks such as Ethernet, Z-net, Net-1, and Wang Net.

Most data communications equipment in use is based on U.S. technology, but the level of the Italian data communications equipment is low. Low-speed modems up to 1,200 bps are currently produced; some manufacturers have developed 2,400 bps prototypes incorporating microprocessors. Private packet switching networks are produced/assembled in Italy by Tran-DNE, a joint venture between Tran (U.S.) and Insud. Italtel and Face Sud lead in public sector of packet switching equipment.

Italtel with a 50-percent share and Are with 30 percent dominate sales of modems to SIP; Philips and Applicazioni Elettrofonicke (AET-Italy) each command about 8 percent and IBM, Codex, Racal Milgo, and Micom, all U.S. firms, supply both public and private sectors. Some Italian companies are entering the market by acquiring U.S. technology: Olivetti represents Bolt, Beranek, and Neumann; Data Consyst, Codex; and Telena, Timeplex.

Communications test and measurement equipment.—Sales of communications test and measurement equipment used outside the lab to analyze, measure, and monitor transmission were estimated at almost $11 million in 1980 and are projected to rise to more than $18 million in 1986. The market is expected to grow with stepped-up purchases of digital instrumentation. Excellent sales opportunities for U.S. manufacturers can be found in protocol analyzers, PCM error analyzers (over 150 mb/s), pattern generator error detectors (up to 150 mb/s), digital radio link analyzers, data transmission analyzers, and voice frequency auto surveillance systems.

Most instrumentation is imported. Leading suppliers of a wide range of products include Hewlett Packard and Tektronix, both U.S. firms that market through their Italian subsidiaries. Spectron, Alcyon, Hekimian Laboratories, AIL, and Telonics also export from the United States.

Wandell & Goltermann leads in German exports, with Siemens and Rhode & Schwarz also participating. Additional third-country suppliers include Marconi, Philips, and Tekelec-Airtronic (France). Japanese firms are rapidly penetrating the broadcast instrumentation market up to 1.5 GHz operating frequency and are improving their aftersales assistance. Anritsu, Takeda, Riken, and Ikegami show increasing popularity, and Sony is entering in joint venture with Tektronix.

Local production in this category is negligible. Elit Elettronica manufactures a sideband analyzer with group delay for TV transmitter specifically for RAI; TVR plans to introduce a low-cost combined waveform and vector scope analyzer; PLLB, founded by two former Telettra engineers, offers instruments for PCM measurements.

Services.—The market for telecommunications services in Italy either rests with suppliers or is monopolized by SIRTI, a company of the STET group. All franchised companies have large engineering staffs that have been instrumental in planning telephone networks, developing equipment specification, and implementing systems either through outside contractors or directly. These firms have access both to a specialized laboratory in Turin—CSELT—for new system design and testing and to a personnel training centers—the Reiss Romoli facilities at l'Aquila—designed to meet their unique needs. ENEL, ENI, FIAT, Montedison, major banks, and other large organizations have established telecommunications departments to interface with suppliers and handle system implementation. Services by external organizations other than hardware suppliers are rarely contracted.

End-User Profiles

The Ministry of Posts and Telecommunications and its multiple operations by far exceed all other end-users investments, accounting for almost 92 percent of the 1980 telecommunications equipment market and projected to account for slightly less in 1986 (see table 4). Banking and insurance industry use, forecast to grow at a 15-percent compound rate between 1980 and 1986, represents the source of Italy's fastest growing demand for communications equipment.

Table 4.—Italy: The market for telecommunications equipment by major end-user sector, 1980 and projected 1986

(in millions of U.S. dollars)

	1980	Projected 1986
PTT	1,464.1	1,765
Broadcasting	58.0	45
Utilities	35.5	15
Bank and insurance	9.5	35
Transportation	7.1	5
Other end-user sectors	18.9	65
Totals	1,593.1	1,930

Source: International Trade Administration, Office of Trade Information Services research study, "The Market for Communications Equipment—Italy."

Ministry of Posts and Telecommunications.—The Italian Government's active control of telecommunications operations goes back almost 50 years to 1933 when the Institute for Industrial Reconstruction (IRI) established STET as the holding company for telecommunications. STET took over the concessionary telephone companies then in operation in central and northern Italy and in 1958 acquired the remaining private telephone companies. In 1964, SIP was created to bring all international telephone operations into a unified structure.

The formation of Telespazio in 1961 under STET auspices for satellite communications responsibility and the incorporation of Italcable into the STET Group in 1965 gave the Government direct control over the management of all public telecommunications services.

The franchise agreement in effect today clearly separates telephone operating responsibilities between SIP and ASST. SIP plans, installs, operates, and maintains local telephone networks and long-distance services among 194 districts throughout Italy. ASST is responsible for the primary Italian telephone network, with central control in Rome, and provides services among 37 districts that include all the major cities in Italy. ASST also handles international telephone service with all European countries and those in the Mediterranean basin. Italcable provides public intercontinental services (including telephone) to all countries not reached by ASST. In 1972, cable TV as well as picture phone, mobile telephone services, and all data transmission at the customer end were turned over to SIP.

In 1980, employment in the Italian telecommunications sector (excluding manufacturing) numbered 104,770, 83.2 percent in telephone operations. Capital expenditures amounted to $2.9 billion,

Italy: Basic Economic Indicators

Population:	57.4 million (1982)
Area:	301,217 sq. km.
Administrative units:	20 regions, 95 provinces, 8,081 communes
GDP:	$350 million (1981)
Contributions to GDP:	Services 51% (1980) Industry 43% Agriculture 6%
Per capita income:	$6,178 (1981)
Inflation rate:	18.7% (1981)
Exports f.o.b.:	$75.7 billion (1981)
U.S. share	$5.1 billion (1981)
Imports c.i.f.:	$91.2 billion (1981)
U.S. share	$6.2 billion (1981)

Major trading partners:	Germany, France, United Kingdom, Netherlands, United States, USSR
Exchange rate:	1,291 lire=US$1 (1982)
Fiscal year:	Calendar year
Current account balance:	+$699.3 million (1981)
International reserves:	$34,951.3 million (1981)
Labor force:	22.7 million (1981)
Unemployment:	8.4% (1981)
Average hourly wage:	$7.44 (1982)

of which 97.1 percent bought telephone systems; revenues totaled $5 billion.

At the end of 1980, the public telephone service counted 13 million subscriptions. Business accounted for about 2.4 million, private users for almost 10 million, and government users, 188,000. Applications for installation outstanding longer than 30 days had risen to 828,000, up dramatically from 479,000 in 1978. The attachment/subscriber ratio dropped to 8.1 percent in 1980 from 9.6 percent in 1976, and by late 1981 had descended to 6.9 percent. Telex subscribers numbered 40,132, a larger increase from the 31,333 in 1978; 8,674 outstanding applications in 1980 compared with 7,999 in 1978.

Of the roughly 19 million telephone sets installed at the end of 1980, pushbutton phones accounted for only 0.4 percent; only 23 out of 9,803 local offices had electronic equiment. The telex switching network consisted of 36 mainly electromechanical switching centers with an overall capacity of 46,662 lines; however, only 87.7 percent were utilized, despite the waiting list, because of inadequate planning. No network exclusively dedicated to data communications exists. At the end of 1980, special-quality circuits in operation numbered 22,097, including 12,054 local circuits. The PT Administration accounts for 15 percent of all modems installed.

The current inventory of Telespazio, the Government's franchised operating company for satellite communications, includes eight Intelsat antennas (four for telecommunications and four for telemetering); two stations with four antennas to control and monitor fading and distortion of 12- and 18-GHz signals bounced back from Sirio satellite; one antenna to monitor broadcasting to and from OTS (Orbital Test Satellite); one antenna for data acquisition from Landsat; and one antenna for telemetering from Marisat. Investments are planned for a second ground station at Lario. A planned ground station near Palermo is highly controversial and may not be built. The final major investment concerning ECS (European Communication Satellite) will probably be assigned to ASST rather than to Telespazio.

Italy's 10-year Telecommunications Plan, drafted in 1980 and yet to be approved, provides guidelines and information on time schedules, investments, and expected technological changes through 1990. Investments are expected to amount to $35 billion to $38 billion in constant 1980 dollars including $31.5 billion to $34 billion for telephone systems with mobile radio, $1.2 billion for the telex system, $1 billion for data communications, $863 million for new services, and $751 million for broadcasting.

Broadcasting.—The Italian broadcasting industry comprises one large company, RAI, and a multitude of small private radio and TV broadcasters. RAI's franchise allows it the right to broadcast audio programs nationally in FM, AM, SW, and LW and TV programs in vhf (channels A-H) and uhf (channels 21-40). RAI's channel 1 reaches 98.8 percent of the population, channel 2 reaches 97.8 percent, and channel 3 (the lastest) reaches 61.5 percent. Revenues come from advertising and from the more than 13 million radio and TV subscribers. RAI employed 13,525 persons in 1980; capital investments totaled $71 million, of which $33.2 million went to broadcast and studio equipment.

Private TV broadcasting began in 1976 and grew rapidly through 1978. Private radio companies began in 1974-76, broadcasting mono or stereo programs in FM. Revenues are exclusively from advertising or services sold to private clients. Statistics published in 1980 by the PT Administration showed 3,548 audio transmitters and transceivers in operation or planned and 3,551 TV transmitters, figures which may underestimate operations in some areas.

The four large private networks are Canale 5 (25 TV transmitters), Rete 4 (23 TV transmitters), Italia 1 (18 TV transmitters), Multiradio (29 audio transmitters) and Rete 105 (9 audio transmitters). A new law is supposed to regulate the broadcasting industry and stop a legal dispute between RAI and the private broadcasters. If the networks are upheld, they should be able to link transmitters and proceed with simultaneous broadcasting. If not, many new studios will spring up.

Public utilities.—The Italian utilities sector consists of two very large national organizations and several smaller municipal firms with limited geographical scope. Electricity is supplied by ENEL, while gas is provided by SNAM of the ENI group. In 1979, the 49 electrical establishments had capital expenditures of more than $2 billion, of which $699.2 million went for machinery and equipment. Gas was provided by 76 establishments with capital expenditures of $353 million, including $51.1 million for machinery and equipment.

From a telecommunications standpoint, both utilities are privileged. Frequency allocations pose no problems; in fact, specific bandwidths have been granted with no limitations on use. As a result, both have developed and constantly upgraded their telecommunications systems.

No government programs directly affect purchases in the sector, but ENEL and SNAM have different philosophies for their large outlays. ENEL has developed its own standards and purchases from suppliers who usually regard ENEL as their preferred, if not sole, client. SNAM has no unique specifications and adopts a more liberal philosophy.

ENEL is completing an extensive microwave network in the 2.5-2.7 GHz range with a maximum capacity of 300 FDM telephone channels. It is also upgrading the service telephone network by replacing electromechanical with electronic switches featuring universal numbering on four-wire cables. A special-purpose data transmission network has recently been implemented featuring three nodal switching centers and 25 multiplexers (to eventually cover the country). Both utilities use PABX's, key systems, short- and intermediate-haul analog microwave systems, facsimile machines, FDM multiplexers, mobile radios, modems, private networks, and all kinds of wire and cable. SNAM, in particular, is adding trunk circuits, voice frequency repeaters, analog carriers, and buried exchange paired

Useful Addresses

Embassies

American Embassy
Commercial Section
Via Veneto 119/A
00187 Rome
tf: 4674
tv: 610450 ambrma

Embassy of Italy
1601 Fuller Street, N.W.
Washington, DC 20009
tf: 328-5500

Telecommunications administration/PTT

Ministero Delle Poste e
Telecommunizioni
Viale America 160
I - 00100 Rome
Attn: Director General
tf: 542 2277
tg: gentel roma
x: 610070 gentel roma

Leased lines and data communications

Societa' Italiana pel L'Esercizio Telefonico P.A. (SIP)
Via Flaminia, 189
Casella Postale AD 2420
I - 00196 Rome
tf: 36 881
tg: sipgen roma
tx: 610467 s phcn

Radio/Television broadcasting

Radiotelevisione Italiana (RAI)
Direzione generale
Viale Mazzini, 14
I - 00195 Rome
Attn: Presidente
tf: 38 781
tg: raidirro roma
tx: 614432 rai rm

Technical standards

Consiglio Nazionale delle Richerche
Servizio Transferimento Innovazione Norme Techniche
Viale Liehi 48B
000198 Rome
tf: 49931
tx: 612322 cnrpfe i

cables. Technology of immediate interest includes statistical multiplexers, security devices, and digital PABX's. Demand for digital microwave transmission should peak after 1986.

Banking and insurance.—Italy's five major banks (all headquartered in either Rome or Milan) each have deposits exceeding $23 billion. Italian banks are interested in expanding and upgrading their telecommunications systems and account for 40 percent of all modems installed. To connect branches, early starters chose a system centered around a few nodal points to which peripheral stations were linked in a star-shaped network. Late arrivals have chosen a decentralized approach, with mesh-shaped networks according to a distributed processing philosophy. A few major banks operate hf radio links that will have to change over to the 2-GHz microwave range to meet WARC requirements. Bankers' technical staffs concentrate on increasing the effectiveness of the interface with the public network—pushing for higher speeds, faster facsimile machines, teleconferencing facilities, and tighter communications security. Banks' progressive philosophies often place them on a collision course with SIP, which is unwilling to provide advanced equipment, and with the PT Administration, which is unwilling to be more flexible toward new equipment. Insurance companies are more able to rely on the public system.

Transportation.—The Italian transportation industry provides full national coverage and has fairly sophisticated telecommunications systems needs. The major railroad organization, the Ferrovie della Stato (FF. SS.), needs an efficient voice and data network to update its services. Ground transportation in 1979 involved $1.3 billion in capital expenditures, of which $45.6 million went to machinery and equipment. Alitalia, the national airline, operates as a state-controlled stock company; air transportation in 1979 had capital expenditures of $134 million with $6.5 million for machinery and equipment.

The current government transportation plan (not approved) allots $38 million for telecommunications equipment expenditures through 1985. FF. SS. and Alitalia buy all kinds of communications products except broadcasting and studio equipment. Interest in new technologies focus on statistical multiplexers, message switching equipment, mobile radios, ground-air stations, and optical fiber systems.

Marketing Practices

Sales channels.—Market researchers believe that U.S. companies can build a strong market base in Italy if they are prepared to manufacture or assemble locally, alone or in joint venture with Italian businesses. Another popular route is licensing Italian firms to manufacture U.S.-engineered goods.

Importers typically have catered primarily to the low end of the market and handled relatively unsophisticated products. Traditionally, they have not provided the aftersales support required by complex modern electronic technology.

Wholly-owned sales subsidiaries and manufacturers' importation are growing in importance. Sales subsidiaries are preferred when the market for a foreign product is already established and technical support and training are vital for greater penetration.

Distributors should be chosen on the basis of their technical and commercial skills, as well as their financial resources. Purchases from foreign-based distributors occur occasionally; the buyer is often a large company with subsidiaries abroad and technical resources sufficient to service the equipment.

Sales promotion techniques commonly include advertisements in Italian trade journals and European periodicals. Specialized seminars/workshops at universities, technical institutes, or on the sellers' premises are frequently held gratis.

Financing.—Italian distributors customarily buy U.S. equipment for 30 to 35 percent below the International Price List, a markdown often considered insufficient to cover advertising and market development expenses. Japanese products sell as much as 60 percent off list; even if aftersales assistance is normally not provided, their high quality makes them very attractive to users.

RAI generally purchases sophisticated foreign equipment because Italian goods do not meet critical standards. RAI representatives often discuss specifications and terms at the supplier's headquarters and bypass the Italian distributor in the preliminary phase of a sale. Traditional trading relationships do not exist in the relatively new private radio and TV market. Owners buy on price and delivery terms and often seem disinterested in technical sophistication.

For certain high-technology data communication equipment, payment terms are more important than price. The distributors must often wait for several months to collect from SIP, for example, while he must pay the U.S. supplier on a 30-day basis (just the time he needs to fulfill all import requirements and take delivery).

Standards and procurement.—Italy's Postal Law of 1936 still applies to all telecommunications equipment. The law states that all aparatus to be connected to the public telephone network must be certified by the Istituto Superiore delle Poste e Telecomunicazioni (Viale America, 00144 Rome, Italy), the Government's Technical Institute, in accordance with CEI (Comitato Elettrotecnico

Italiano, Viale Monza 259, 20156 Milan, Italy) standards. Certification includes a 6- to 12-month field test by the franchised companies that are potential customers. Communications equipment operating in Italy usually conforms with standards issued by CCITT (International Telephone and Telegraph Consultative Committee), ITU (International Telecommunications Union), and CEPT (Conference Europeenne des Poste et Telecommunications). Some products must comply with individual purchaser standards as well.

The mechanics of government tendering procedures are believed to be purposely vague. Tenders are not normally advertised broadly. Any foreign manufacturer interested in marketing products in Italy must start by appointing an official Italian representative or creating an Italian subsidiary. The bidder's name should be included in an approved supplier list and the product certified by the PT Technical Institute.

Trade Restrictions

Customs duties currently applicable to telecommunications equipment are detailed by Customs Cooperation Council Nomenclature (CCCN, formerly BTN) codes. Rates range from 6 percent to 12 percent for most telecommunications equipment; all imports from the European Economic Community are duty free. A 15-percent value added tax is charged on landed value plus duties. Performance bonds are not required unless part of a specific contract. No foreign exchange restrictions, bilateral trade agreements, or taxes or other levies on telecommunications equipment imports not applied on similar domestic products are in effect. Place-of-origin certificates are important in accelerating product nationalization.

Additional Information

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For additional copies of this Survey or a catalog listing other County Market Surveys, please contact:

International Market Research Services
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The Survey summarizes a 134-page research report prepared by J.B.A., Milan, Italy, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey as well as the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "Survey on the Italian Market for Communications Equipment," ITA 82-05-505, February 1982.

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Country Market Survey

MINING INDUSTRY EQUIPMENT

Yugoslavia

DEPOSITORY
JAN 26 1984
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The market for mining industry equipment in Yugoslavia is expected to surge strongly, from $467 million[1] in 1981 to $805 million in 1986. (see table 1). The impetus for such growth is attributed to Yugoslav economic development policy, which calls for the substantial extension and upgrading of the country's mining operations. In carrying out this policy, Yugoslavia is pursuing a twofold objective: the supply of coal for power and steam generation and the supply of mineral raw materials for domestic industry and for export.

Sales of mining excavating, earthmoving, and extraction are forecast to leap from $233 million in 1981 to $430 million in 1986, an annual growth rate of 13 percent. The market for conveying and transportation equipment is predicted to grow b 8.7 percent annually, mounting from $165 millio in 1981 to $250 million in 1986. Growth in thes market segments will stem primarily from the exploitation of new mines and the modernization o existing ones.

Demand for mineral preparation and processin equipment and accessories is expected to grow substantially between 1981 and 1986, with sales jumping from $50 million to $100 million. The antic pated 14.9 percent annual growth rate is linke with national plans for the construction of iron or processing and zinc production plants, and for th capacity expansion of existing copper smelting, zin production, and alumum smelting plants.

Sales of mining exploration, prospecting, an minerals research/geochemical equipment and instruments are forecast to rise by 5.6 percent annually increasing from $19 million in 1981 to $25 millio in 1986. Government plans to intensify the prospecting of nonferrous metals and nonmetallic minera

Table 1.—Yugoslavia: The market for mining industry equipment

(in millions of U.S. dollars)

	1978	1979	1980	1981 (Estimated)	1986 (Projected
Mining, excavating, earthmoving, and extraction machinery and equipment					
Production	80	115	120	125	270
Imports	64	106	138	141	220
Exports	9	26	29	33	60
Market size	135	195	229	233	430
Conveying and transportation equipment					
Production	75	100	120	130	180
Imports	47	71	66	67	150
Exports	9	21	28	32	80
Market size	113	150	158	165	250
Mineral preparation and processing equipment and accessories					
Production	5	20	20	25	50
Imports	22	28	33	32	60
Exports	1	8	4	7	10
Market size	26	40	49	50	100
Mining exploration, prospecting, and minerals research/geochemical equipment and instruments					
Production	3	4	5	6	10
Imports	7	10	12	14	17
Exports	1	1	1	1	2
Market size	9	13	16	19	25
Total all categories combined					
Production	163	239	265	286	510
Imports	140	215	249	254	447
Exports	20	56	62	73	152
Market size	283	398	452	467	805

Source: International Trade Administration, Office of Trade Information Services, research study, "The Market for Mining Industry Equipment—Yugoslavia" (see Additional Information box).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=18.64 dinars (1978), 19.0 dinars (1979), 24.91 dinars (1980), and 27.30 dinars (1981 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

es will stimulate demand for equipment in this arket segment.

Competitive Assessment

Coupled with its efforts to increase the prouctivity of its mining industry, Yugoslavia intends boost domestic production of mining industry quipment. Despite recent significantly higher sales f locally-made machines and apparatus, however, nports are expected to continue to account for more han half the market between 1981 and 1986. Doiestic manufacturers generally produce relatively imple mining industry equipment or specialize in a ew types of advanced equipment. Thus, in terms of oth quantity and quality, a need exists for imported roducts.

Sales of foreign-made equipment, which stood at 254 million in 1981, are expected to climb to $447 nillion in 1986. Mining excavating, earthmoving, nd extraction machinery and equipment, by far the argest market segment, enjoyed 1981 import sales f $141 million, a figure that is predicted to jump o $220 million in 1986. Imports of conveying and ransportation equipment are forecast to more than louble from $67 million in 1981 to $150 million in 1986. Foreign companies supplied $32 million worth of mineral preparation and processing equipment nd accessories in 1981 and are forecast to boost heir sales to $60 million in 1986. Finally, imported mining exploration, prospecting, and minerals research/geochemical equipment and instruments accounted for $14 million in sales in 1981, and are predicted to push that figure to $17 million in 1986.

Yugoslav end-users expect imported equipment to represent state-of-the-art technology, offer cost-efficient operation, and be accompanied by reasonable financing arrangements. Western nation brand-name companies that can offer creative financing packages will enjoy a competitive edge in this market. Western suppliers have increased their sales in recent years at the expense of manufacturers based in the Soviet Union and East Europe (see table 2). However, Soviet and Eastern European companies, which trade through long-term barter agreements or clearing account agreements with Yugoslavia, are expected to supply an increasing proportion of imported equipment between 1981 and 1986.

U.S. suppliers of heavy-duty mining/earthmoving equipment for opencast mining face little competition, but those offering conveying systems must vie with third-country and domestic firms. In addition, conventional U.S.-made products must compete with low-priced equipment from third-country manufacturers, which also constitute a major force in the supply of equipment for underground mining.

Table 2.—Yugoslavia: Imports of mining industry equipment by country of origin, 1978-80

(in thousands of U.S. dollars)

	1978	1979	1980
Mining excavating, earthmoving and extraction machinery and equipment			
United States	9,850	19,490	17,750
Sweden	3,640	11,500	53,960
West Germany	17,630	28,040	25,820
East Germany	8,460	9,480	9,280
U.S.S.R.	7,260	8,280	8,230
Other	17,540	29,160	23,030
Total	64,380	105,950	138,070
Conveying and transportation equipment			
United States	8,170	12,720	9,660
West Germany	6,870	16,060	13,860
Poland	10,980	6,100	8,210
Austria	940	3,590	5,990
U.S.S.R.	5,920	5,950	5,190
Other	13,750	26,760	23,070
Total	46,630	71,180	65,980
Mineral preparation and processing equipment and accessories			
United States	2,200	1,690	1,310
West Germany	7,780	13,770	9,170
Italy	3,270	4,840	6,640
United Kingdom	750	1,340	6,400
East Germany	770	1,200	2,980
Other	6,770	5,190	6,800
Total	21,540	28,030	33,300
Mining exploration, prospecting, and minerals research/ geochemical equipment and instruments			
United States	800	900	1,100
West Germany	1,200	1,300	1,400
East Germany	1,000	1,300	1,300
U.S.S.R.	600	800	1,000
Switzerland	600	700	800
Other	2,800	5,000	6,400
Total	7,000	10,000	12,000
Total (all categories combined)	139,550	215,160	249,350
United States total	21,020	34,800	29,820

Source: See source notation of table 1.

Domestic suppliers.—Between 1981 and 1986, the share of the mining industry equipment market held by domestic companies is expected to grow moderately.

Yugoslav mining equipment originates from four sources: large self-administered socialistic machine-building concerns, the mining industry itself, major electrical engineering companies, and engineering firms. Eleven producers generate most of the mining equipment manufactured in the country. The indus-

Table 3.—Yugoslavia: Analysis of the market for selected mining equipment

Major products/production	Market for U.S. equipment	Competition	Principal competitor (countries)
Mining excavating, earthmoving, and extraction machinery and equipment			
Blasting accessories	High	Strong	United States, Sweden, West German
Mine shaft-sinking equipment and support devices	Good	Strong	Sweden, West Germany, United Kingdo
Drilling and heading equipment	High	Strong	United States, West Germany, Unite Kingdom, Sweden
Coal mining (underground)	Fair	Strong	West Germany, U.S.S.R., United Kingdom, France
Open pit/surface mining	High	Strong	Domestic, United States, West German East Germany, U.S.S.R.
Conveying and transportation equipment			
Conveying, loading, and hauling equipment	High	Strong	Domestic, Poland, West Germany U.S.S.R., Austria
Movable systems	High	Strong	Domestic, United States, West Germany East Germany
Conveyor parts and accessories	High	Strong	Domestic, United States, West Germany U.S.S.R.
Shaft winding equipment	Good	Strong	Domestic, Italy, West Germany
Cranes and booms	Good	Strong	West Germany, France
Winches and hoists	Fair	Strong	West Germany
Aerial ropeways	Good	Strong	Domestic, West Germany, Poland, Ital
Elevators	Fair	Strong	West Germany, Austria, Italy
Rail-type equipment and components	Fair	Strong	Domestic, Poland, U.S.S.R., West Germany
Trackless equipment	Good	Strong	West Germany, Italy
Winding components	Fair	Strong	West Germany, Italy, United Kingdom
Ancillary equipment and components	Good	Strong	Domestic, West Germany, Poland
Mineral preparation and processing equipment and accessories			
Basic processing equipment and accessories	High [1]	Strong	United States, United Kingdom, Wes Germany, Sweden
Crushing equipment	Good [1]	Strong	West Germany, U.S.S.R., East Germany Japan
Screening equipment	Good [1]	Strong	Domestic, West Germany, Japan U.S.S.R.
Classifiers	Good [1]	Strong	Domestic, West Germany, United Kingdom
Dewatering equipment	Good [1]	Strong	Domestic, Sweden, West Germany United Kingdom
Washing equipment/scrubbers	Fair	Strong	West Germany, United Kingdom
Kilns and furnaces	Fair	Strong	Domestic, West Germany, U.S.S.R., East Germany
Feeders	Good [1]	Strong	Domestic, Italy, West Germany
Dryers	Good [1]	Strong	Domestic, France, West Germany United Kingdom
Vibrating, shaking equipment	Good [1]	Strong	West Germany, United Kingdom
Separators, other	Good [1]	Strong	West Germany, Italy, France, Sweden
Heating and cooling equipment	Fair	Strong	West Germany, East Germany
Dust equipment	Good [1]	Strong	West Germany, East Germany
Mixing and blending equipment	Fair	Strong	West Germany, East Germany, United Kingdom
Grinding mills	Good [1]	Strong	Domestic, East Germany, West Germany

(Continued on next page)

Table 3.—Yugoslavia: Analysis of the market for selected mining equipment—continued

Major products/production	Market for U.S. equipment	Competition	Principal competitor (countries)
ining exploration, prospecting, and minerals research/geochemical analysis equipment and instruments			
Exploration	Good	Strong	West Germany, East Germany, Switzerland, U.S.S.R.
Area research and exploration drilling	High	Strong	United States, West Germany, U.S.S.R.
Prospect drilling	High	Moderate	United States, West Germany, U.S.S.R.
Ancillary prospecting	Good	Strong	West Germany, East Germany
Geophysical equipment for geological resources	High	Strong	United States, West Germany, Switzerland, France
Geological tools	High	Strong	United States, West Germany, East Germany
Geochemical equipment/laboratory analytical	High	Strong	United States, West Germany, France

[1] In particular sold as components or subsystems of large mining projects, engineered by U.S. or other Western companies.

Source: See notation of table 1.

ry focuses on apparatus for use in open pit mining, vith emphasis on single machines rather than sysems.

Current Yugoslav production of mining excavatng, earthmoving, and extraction machinery and :quipment is restricted to individual machines such is coal cutters and breakers, small or medium-sized crapers/dozers, and power shovels. Leading domesic producers include MIN (excavators), and REK Plastika Velenje (underground mining equipment). Yugoslav firms lack the capability to manufacture igh-capacity mining machines for open pit or unlerground mining, or advanced drilling equipment. Iowever, the Kolubara coal mining company is leveloping large excavators for use in strip mining f lignite, and the domestic mining equipment indusry has produced special machines for use in underround lignite mining. In both cases, Yugoslav nanufacturers have used the know-how of leading oreign mining equipment companies.

Yugoslave makers of conveying and transportation quipment have expanded their production capaities, developing and designing much of the equipnent themselves. In the manufacture of trucks, omestic producers concentrate on turning out small nits. At present, complete plough-type, shearing, nd winding/loading systems are not produced locally. The major organizations active in this market egment include Energoinvest (conveying systems or open pit coal mines), Geomasina (underground onveying equipment), Gosa (trucks), and Rade Koncar and the three mining enterprises of Kastolac, Kolubara, and Kosovo (open pit coal conveying quipment).

Mineral preparation and processing equipment nd accessories are produced by several Yugoslav rms, including Minel, Rade Koncar, Kastolac, Kolubara, and Kosovo. The crushers, sorters, and pumps manufactured by domestic companies meet international standards. In addition, the relatively simple machines produced locally enjoy a price advantage in the marketplace.

Sensing devices used in mining exploration, prospecting, and mineral research are assembled in Yugoslavia, mainly from imported parts. Local manufacture of sophisticated instrumentation for use in seismologic, magnetic, electromagnetic, and gravimetric exploration methods is nonexistent, however.

Yugoslav companies are making an effort to incorporate electronic controls in all types of mining equipment. Through cooperative arrangements with European companies, domestic enterprises are acquiring the knowledge that will enable them to manufacture advanced electronically controlled equipment.

Local manufacture of mining equipment in Yugoslavia is promoted in several ways. The mining equipment industry enjoys priority in the allocation of funds and foreign currency to achieve its production targets. The Yugoslav Government also promotes joint ventures between domestic and foreign companies by offering such incentives as tax reductions and investment guarantees for the capital provided by the foreign company.

U.S. suppliers.—Considerable demand for U.S.-made equipment exists in Yugoslavia, and U.S. suppliers have held between 12 percent and 16 percent of the import market in the past few years, with sales in 1980 approaching $30 million. Future purchases of equipment from U.S. companies, however, will depend largely on the availability of hard currency in Yugoslavia.

Yugoslav planners' aim to raise the productivity of the country's mining operations and to concentrate on large-scale projects which are expected to favor U.S.-produced equipment. In addition, U.S. companies lead in the manufacture of equipment for such new technologies as blasthole drilling, as well as in the production of very heavy haulers/loaders, high-performance ore-processing equipment, and fully computerized exploration instruments (see table 3). Yugoslave mining engineers acknowledge that U.S. equipment is superior in a number of market segments.

In the mining excavating, earthmoving, and extraction machinery and equipment segment, need for U.S. firms' products focuses on crawler- or truck-mounted blasthole rotary drills, which can range from small mobile units to twin-boom drill jumbos that are parts of load/haul/dump systems. U.S. companies active in the supply of hydraulic and electric drills include Drilco (a subsidiary of Smith International), Eimco, Gardner-Denver, Ingersoll-Rand, Joy/Robbins, and Marion Power Shovel (a subsidiary of Dresser Industries). U.S.-made bits, which are considered to be among the best available, especially for use in rough conditions, are supplied by Dresser Industries, Hughes Tools, and Smith-Gruner (a subsidiary of Smith International). U.S. firms are also viewed as technical leaders in the manufacture of drilling rods and guides.

A market exists for U.S.-produced heavy-duty mining/earthmoving equipment for use in open pit mining. Haulers with mechanical and electrical transmission systems, dozers and scrapers, wheel and front-end loaders, rear-dumpers, and electric power shovels have been purchased from U.S. firms. American companies supplying this type of equipment include Harnishfeger (electric shovels), Marathon Le Tourneau (front-end loaders), and Unit Rig, and Wabco (haulers).

Little U.S.-made equipment for use in underground mining is now sold, but the growing need for blasthole drills may improve sales prospects. U.S.-produced equipment is often associated with "room-and-pillar" mining, which is thought to leave much of the mineral resources in the ground. U.S. manufacturers of systems that operate economically in small seams where full exploitation of the minerals is crucial can demonstrate the variety available in goods from U.S. firms.

Several U.S.-designed and -made conveying systems have been installed in Yugoslav mines. In particular, belt feeders, pulleys, idlers, belt scales, variable-speed-drive apron feeders, magnets, and motors and drives made by such firms as Allis Chalmers, Dresser Industries, Joy Manufacturing, and Stephens-Adamson (a subsidiary of Allis Chalmers) are used in large mining operations. The proven efficiency of these systems is expected to create sales opportunities for other high-performance, durabl and reliable equipment supplied by U.S. companie Makers of power shovel/truck systems are encou aged to promote trolley systems as a means c reducing energy use and operating costs. The firms should also stress that trucks represent muc lower initial capital costs than do conveyor system In addition, the many possible combinations c trucks and stationary or movable conveying system should be highlighted.

U.S. manufacturers have supplied several types c mineral preparation and processing equipment fo use in Yugoslav copper mines: crushers, grinders flotation systems, ball mills, slurry pumps, ai clutches, filters, electronic process control systems and motors. In addition, U.S.-made processing systems for yellow cake production are popular in th uranium industry. The Government's expansio plans for both the copper and uranium industrie should create additional sales opportunities fo U.S. suppliers. American firms active in this marke segment include Ametek, Allis Chalmers, Koppers Warman, Wemco, and Wichita.

The market for analytical instruments used i prospecting and processing is dominated by U.S firms. The electronic sophistication of equipmen supplied by U.S. companies is expected to creat excellent sales opportunities for seismographic measuring and sensing devices, electronic evaluatio devices, vibrators, and advanced instruments for us with gravimetric, magnetic, and geoelectric prospecting methods. This instrumentation is supplied b Hewlett Packard, McPherson, and Texas Instruments.

Several U.S. companies—Dresser Industries/Jeffry, Gardner-Denver, Ingersoll Rand, and Joy Manufacturing—supply compressors as separate items and demand is expected to increase. Three U.S engineering companies have also been awarde contracts in Yugoslavia: Davy McKee (for the Bucim copper mine), Fluor Mining and Metals (for a uranium mining and processing plant), and Mountain State Engineers (for a conveying system in the Majdanpek copper mine).

Some end-users have claimed that U.S.-made equipment is not always suitable for European operating conditions. Trade experts thus suggest that U.S. suppliers familiarize themselves with local geologic and economic conditions and tailor the information on their products to the Yugoslav market. U.S. companies that can demonstrate a longer service life and lower maintenance costs for their products than those of their competitors should emphasize these advantages in their marketing efforts. Most U.S. companies currently supplying the Yugoslav market maintain a servicing operation within the country. Such maintenance service operations m an indespensable base for market penetration d can be profitable.

Third-country suppliers. — West German firms ve traditionally been leading suppliers in the goslav mining equipment market; and in 1980 ned sales of more than $50 million. Many Yugo- v senior engineers and managers attended German hnical schools and universities, and German— first foreign language taught in Yugoslav schools is still spoken widely. Yugoslav technical stand- ls are based on German standards, and close operation between Yugoslav and German com- nies has helped the latter to achieve a dominant sition in some market segments.

West German manufacturers rank particularly gh as suppliers of open pit mining equipment cavators, dredging systems, loaders, continuous nveying systems), laborsaving underground ma- inery (road headers, powered roof support sys- ms, combined shearing/loading/conveying sys- ns), and mineral sorting/grinding/cleaning uipment. Little heavy hauling and trailing equip- ent is supplied, however. The major West German ms supplying the Yugoslav mining industry include eilmann-Haniel, Gebr. Eickhoff, Halbach & Braun, ausherr, Kennametal, Klockner-Becorit, Krupp, aschinenfabrik Augsburg-Nurnberg, Mannesmann- emag, Orenstein & Koppel, Schopf, Thyssen heinstahltechnik/Bergbautechnik, Westfalia Lunen, d Wirth.

Yugoslav plans to extend the country's lignite ip mines are expected to create good sales oppor- nities for West German suppliers. The German proach of continuous handling of overburden and al is preferred by Yugoslav end-users to the power ovel/truck approach.

In 1980, imports of mining equipment from veden more than quadrupled in value; jumping almost $54 million from their 1979 level of $11.5 illion. Swedish-made equipment is considered to present the state of the art, and is placed on a par th equipment made in the United States, West ermany, and the United Kingdom. Equipment om Sweden is also perceived as being laborsaving, liable under the most extreme conditions, and ice competitive. The Swedish export credit bank pports the sale of equipment to Yugoslavia, and vedish companies are willing to engage in co- erative arrangements with Yugoslav mining equip- ent manufacturers.

The Swedish firm Atlas Copco, which supplies compressors, drills, loaders, dumpers, and hoists, counts for roughly three-quarters of all Swedish- ade mining industry equipment purchased in Yugo- via. Other companies active in the market include la, Fageska-Secoroc, and Linden-Alimak.

The success of Soviet suppliers in the Yugoslav market, demonstrated by 1980 sales in excess of $14 million, is attributed to the sturdiness and technical sophistication of their equipment as well as the convenient trade terms they offer. Machinoexport, the Soviet foreign trade organization, markets to Yugoslav end-users such products as loading machines, quarry shovels, cutters/loaders, rotary percussive drill-rigs for open pit mining, cone crushers, and processing equipment for metallurgical mining.

Like Soviet firms, East German companies sell mining equipment on the basis of a clearing account, which does not require the exchange of hard currency. Sales in 1980 by these suppliers approached $14 million. East German firms, operating through the foreign trade organization Takraf, supply excavators, draglines, and continuously working transport equipment. They are also gaining recognition as manufacturers of processing equipment, especially for use with soft coal and nonferrous metals, and as makers of exploration instruments and equipment.

Italian suppliers enjoy the advantage of proximity to the Yugoslav market, an especially strong factor when the transportation of heavy equipment is involved. Italy is an important supplier of mineral processing equipment. Italian firms, relying extensively on U.S. and Swedish technology, have greatly increased their sales of mining equipment in recent years, partly at least because of the price competitiveness of their products.

British companies are considered to be reliable suppliers of such underground mining and sorting/processing equipment as complex tunnel shielding apparatus, powered roof support systems, double drum shearing equipment, and large breaker/feeder systems. Manufacturers, some affiliated with U.S. firms, active in the market include Jeffrey, Ingersoll Rand, Eimco, Anderson, Dosco Overseas Engineering, Dowty Mining Equipment, Massey Ferguson, and Mindev.

Austrian companies serving Yugoslav end-users benefit from proximity and traditional trade ties. Voest Alpine and its subsidiary Boehler supply tunneling and extracting machines and shaft-sinking, drilling, and conveying/transport equipment.

French companies—led by Poclain—supply heavy-duty hydraulic excavators and power shovels. Some suppliers specialize in underground mining equipment and have established a niche for themselves in this market segment. French companies also promote sales through favorable credit terms.

Swiss companies supply instruments for mineral exploration, production drills for underground mining (Schweizerische Industrie-Gesellschaft), and metal processing equipment (Alusuisse). Polish and Czechoslovak firms serve as important suppliers of transport equipment, and the Japanese companies offering crushers and underground mining equipment participate in the market as well.

The Mining Industry

The mining industry in Yugoslavia accounted for 7.1 percent of GNP in 1980, a share that is expected to grow to between 8 and 8.5 percent in 1985. The increase is attributed to the high priority the Government has assigned to exploiting the country's wealth of mineral resources (see table 4). Yugoslavia seeks thereby to reduce imports while increasing exports and thus improve its trade balance.

Key minerals in the country's economic development plan include coal (mainly lignite and subbituminous), copper, iron ore, lead/zinc, bauxite, and uranium. Coal is intended for use both as a fuel, replacing oil, and as feedstock in the chemical industry, replacing oil derivatives. The planned growth of the domestic metallurgical industry will require that increased quantities of iron ore be mined, and the copper and aluminum processing plants that are slated for construction will satisfy growing demand for copper ore and bauxite.

Yugoslavia already exports bauxite, lead/zinc, and copper (see table 5). Processing these and other minerals before export, which the industry is now doing, increases their value and export earnings. Although coal is not likely to be exported, the country may distribute electricity generated from domestic coal to neighboring countries.

In 1979, some $300 million was invested in the coal industry, $280 million in the nonferrous metals industry, and $18 million in the iron ore industry. The total mining industry included 298 establishments and a work force of 94,100 (see table 6).

Three major organizations act as advisors to t
Yugoslav mining industry: the General Associati
of Yugoslav Coal Mines, the General Associati
of Nonferrous Metals Industry, and the Gene
Association of Nonmetals Mining and Indust
Guidance on the purchase of mining equipment
included in the advice offered by these groups.

Coal.—Coal production, which stood at 47 m
lion tons in 1980, is expected to reach 82 milli
tons in 1985. Some hard coal (3.4 million tons
1980) is imported for use in the steel industry.

Yugoslav coal reserves are estimated at 20-
billion tons, with about half of the deposits locat
in the Kosovo region in the southern part of t
country. Major deposits are also situated in t
Serbian and Macedonian republics. Three regio
lead in coal production: Kosovo, whose output
15 million tons in 1980 is expected to be surpass
with 20-25 million tons in 1986; Kolubara, whi
produced 18.5 million tons in 1981 and should yi
50 million tons a year by 1990; and Kostolac, wh
output of 3.5 million tons in 1980 is planned
rise to 10 million tons in 1990. Ten major c
mines are in operation in the country; and six n
mines are scheduled for construction within the ne
several years (see table 7).

Open pit operations, which mine mainly ligni
account for 80 percent of all coal mining in Yug
slavia. In these operations, the use of discontinuo
power shovel/truck systems has generally given w
to the use of continuously working bucket whe
excavators. More than 90 percent of the overburd
and 70 percent of the coal are now transported

Table 4.—Yugoslavia: General mineral production

(in thousands of tons)

Commodity	1970	1975	1980	1985 (Projected)	1990 (Projecte
Metallic minerals					
Iron ore	3,694	5,239	4,530	8,000	8,000
Copper ore	9,420	14,675	19,559	25,000	28,000
Lead/zinc	3,113	3,606	4,284	5,000	6,000
Bauxite	2,098	2,306	3,138	4,500	6,000
Nonmetallic minerals					
Asbestos	334	277	268	400	400
Magnesite, crude	512	485	262	300	350
Clays	NA	400	680	750	800
Sand, quartz	982	1,605	2,100	2,400	2,800
Salt	120	295	377	450	450
Coal					
Hard coal (bituminous)	643	598	388	Neg.	Neg.
Brown coal (subbituminous)	8,989	9,430	9,665	15,000	25,000
Lignite	18,970	25,509	36,949	67,000	70,000

Source: Statistical Yearbook of Yugoslavia 1981.

Table 5.—Yugoslavia: Export of important minerals

(in thousands of tons)

mmodity	1978	1979	1980 Estimated	1981 Estimated	1986 Projected
allic minerals					
Iron ore and concentrates	16	NA	20	20	20
Copper sulfate	12	21	30	40	40
Lead/zinc, ore and concentrate	42	44	45	45	50
Bauxite and concentrate	676	525	700	800	1,000
metallic minerals					
Asbestos	2	2	)	no meaningful figures	
Magnesite	31	28	)		
Clay	20	25	)	or estimates available	
Sand, quartz	12	16	)		
Salt, brine	Neg.	3			
l					
Anthracite and bituminous	1	NA	Neg.	Neg.	Neg.
Lignite and lignite briquets	435	375	350	350	1,000

urce: See notation of table 1.

veying systems rather than by truck and track tems.

In underground operations, where most of the sub- uminous coal is mined, investments are aimed at dernizing and upgrading machinery and conse- ently improving worker productivity. Anthracite d bituminous coal are also produced in under- und mines, but the limited resources and high fur content of this hard coal have precluded its reased production.

Iron ore.—Iron ore production reached 4.5 mil- n tons in 1980, meeting about 80 percent of mestic demand. Although Yugoslav planners con- er domestic iron ore mines capable of fulfilling the country's requirements, imports of iron ore nost doubled between 1978 and 1979. Yugo- via's iron ore deposits are relatively low grade, h an iron content ranging from 36 percent to 42 rcent. In addition to increasing the output of the ntry's iron ore mines, national policy seeks to prove the quality by producing iron ore concen- tes.

The country's reserves of iron ore are estimated 1.5 billion tons. Of the total known deposits of 0 million tons, three areas—Ljubja and Vares in snia and Omarska in Hercegovina account for 0 million tons. Combine RMK Zenica, which erates opencast and underground mines at the snia sites, plans to expand production at Ljubja d develop three opencast mines at Omarska. ditional deposits of about 100 million tons are ated in Macedonia.

Copper.—The production of copper, which more n doubled between 1968 and 1978, rose to nearly 20 million tons in 1980. In 1978, Yugoslavia accounted for more than 40 percent of total Western European production of copper. Although the Yugoslav copper ore has a relatively low metal content, sizable deposits that lend themselves to opencast mining make exploration economically feasible.

The largest copper deposits are located in East Serbia at Majdanpek (500 million tons) and Bor (600 million tons). Majdanpek, the largest copper mine in Europe employs opencast mining to produce 14 million tons annually. A conveyor system is being installed in the mine to reduce operating costs and improve productivity. The Bor mine produced 4.5 million tons of copper ore in 1978 and the Veliki Krivelj (also in Bor), which began operation in 1981, is expected to produce 8 million tons annually.

Lead/zinc.—Lead/zinc production in 1986 exceeded 4 million tons, but the declining metal content of the ore has resulted in increased imports of lead/zinc concentrates. The country's reserves of lead/zinc are estimated to exceed 100 million tons, with the largest deposits located in Trepca in the Kosovo region and at Mezica in Slovenia. In 1978, seven mines accounted for 80 percent of total lead/zinc production, most of it in underground operations.

Bauxite.—Yugoslavia accounted for 35 percent of Western European bauxite production in 1978. The bauxite mined in Yugoslavia—mainly in open pit operations—is of good quality, with an aluminum content ranging up to 55 percent. The country's reserves are put at roughly 300 million tons, located mainly along the Adriatic coast, with the largest deposits in Montenegro. Three mines account for 80 percent of the country's output: Vlasenica in Bosnia, the largest bauxite mine in Western Europe with deposits of 30 million tons; Niksic-Fournira in Montenegro; and Dbrovac in Croatia; these mines are primarily open pit operations.

Uranium.—The Yugoslav Government seeks to make uranium an important source of energy. To this end, the underground mining plant of Zirovski in Slovenia began operating in 1980, producing 160,000 tons of uranium ore. The plant's output is considered sufficient to fuel 6 of the 12 nuclear power installations planned for the country.

Market Access

Business practices.—Most major projects are contracted by tender and are open to foreign competitors. Generally, the Yugoslav purchaser must be able to demonstrate that the equipment supplied by foreign firms is not manufactured in Yugoslavia. When a project is financed by a multinational institution or through a bilateral agreement, the selection of equipment suppliers is influenced by the parties-at-interest. Foreign companies are advised to work closely with Yugoslav purchasing agencies and their technical consultants to help shape project specifications. Actual competition for a contract begins when the technical features of a project are being decided, not when they are actually published. The journal *Sluzbeni list SFRJ* carries the major public tenders.

Foreign companies bidding on a project are often asked to indicate what percentage of the equipment can be supplied by local firms. The higher the domestic share, the greater the chance of contract award to a foreign supplier. All companies bidding on a project should provide corporate information together with a list of references and a description of technical achievements,

Of the three or four trade channels open to foreign suppliers, the most important remains the direct sales route. Most foreign companies maintain marketing manager in Europe and also contra with a Yugoslav trading company to act as an age in the country. Yugoslavian trading companies ma be very useful in finding the right contacts, providin first-hand information, and assisting in contra negotiations.

Because of the shortage of hard currency an the expense of bank credits, competition amon several bidders on a large project often focuses o financing conditions and credit terms rather than o price. Some suppliers grant discounts in the form easier payment terms rather than price reductions.

Most Western companies will accept orders onl if a letter of credit is confirmed by a recognize bank. More than a year is required, however, fo the allocation of hard currency enabling Yugosla purchasers to open a letter of credit.

Participation in the International Mining an Energy Fair, held every 2 years in Zagreb, is recon mended for foreign suppliers. The fair is open participation by foreign firms without representatio Industry experts also suggest that prospective ve dors organize seminars on advanced high-producti ity mining, and that they translate all sales literatu into Serbo-Croatian.

Trade and Technical Regulations.—Some minir industry equipment is exempt from customs dutie In addition, any imported capital goods that man facturers need for production are granted preferenti customs treatment. Import duties are applied on a ad valorem basis. In early 1982 import tariffs levie on selected other products range from 5 percent 17 percent.

The following charges are also assessed on tl dutiable value of imports: 1 percent customs ev dence tax, 6 percent equalization tax, and 5 perce import surcharge.

The metric system of weights and measures employed in Yugoslavia. Industrial electrical pow supply is both 220 volts, single-phase, alternati current and 380 volts, three-phase, alternating cu rent.

Table 6.—Yugoslavia: Size of the mining industry, 1979

	Number of establishments	Number of employees	Number of establishments by size		
			Large [1]	Medium [2]	Small
Iron ore mining	12	4,300	4	7	1
Nonferrous metals mining	59	25,300	18	25	16
Nonmetallic minerals mining	92	11,700	2	36	54
Coal extraction	135	52,800	37	68	30

[1] Employing more than 500.

[2] Employing 250 to 500.

[3] Employing fewer than 250.

Source: Statistical Yearbook of Yugoslavia 1981.

Table 7.—Yugoslavia: Mining industry planned investment projects

(in millions of U.S. dollars)

modity	Company	Location	Project	Completion Date
l		Moscanica, Bosnia and Hercegovina	New mine producing 500,000 tons/year	Start construction in 1984
l		Mostarbasin in Bosnia and Hercegovina	New mine	
l		Tuzla, Bosnia and Hercegovina	New mine producing 3 million tons/year	Production to begin in 1986
l		Drmno, near Kostolac in Serbia	New open pit mine producing 6 million tons/year by 1986 and 9 million tons/year by 1990	
l		Dobrnja-Lukavac in Tuzla	New strip mine producing 3.2 million tons/year	Production to begin in 1983
l		Jasenovac at Krepoljin	Mine expansion to 105,000 tons/year	Expanded capacity to be reached by 1984
al		Poljani, Serbia	New mine producing 600,000 tons/year (Planned)	
al		Melnica, Serbia	Reopening of old mine; 300,000 ton-per-year capacity (Planned)	
n ore	Combine RMK Zenica	Omarska, Hercegovina	Three new mines, with initial capacity of 2 million tons/year rising to 3 million tons/year	Production to begin in 1983
n ore	Combine RMK Zenica	Ljubja, Bosnia	Mine expansion to 4.3 million tons/year capacity	
pper		Bor	Two new opencast mines	
pper		Veliki Krivelj, Bor	Smelter capacity increase from 90,000 tons/year to 134,000 tons/year	Expansion complete by 1985
ad/zinc		Sastavci-Kizevak, Mt. Kopaonik, Serbia	New mine producing 1,875 tons of zinc concentrate, 750 tons of lead concentrate annually	Production to begin in 1983
ad/zinc		Delcevon, Macedonia	New mine producing 500,000 tons/year	Completion scheduled for 1986
ad/zinc		Toranica mine, Kriva Palanka, Serbia	New mine producing 700,000 tons/year of ore or 25,000 tons/year of lead/zinc concentrates	
ad/zinc		Trepca, Serbia	New zinc electrolytic plant producing 80,000 tons/year of zinc	Operation to begin in 1983
ad/zinc		Zorka, Serbia	Expansion of zinc plant to produce 40,000 tons/year of zinc and 140 tons/year of cadmium	Operation to begin in 1983
ad/zinc		Veovaca mine, Vares, Bosnia and Hercegovina	New mine producing 10,600 tons/year of zinc and 9,400 tons/year of lead concentrates	
uxite	Rudnik Boksita Vlasenica	Serbia	New mine producing 900,000 tons/year of bauxite	
uxite		Boris Kidric aluminum smelter, Slovenia	Expansion of smelter from 45,000 tons/year to 60,000 tons/year	Completion scheduled for 1985

Additional Information

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Greece's late entry into the computer age has meant relatively slow growth in the market for computers and peripheral equipment in the past. But it has also allowed users to learn from others' experience and to tailor hardware purchases more closely to processing needs. Trade sources predict steadily growing demand through the mid-1980's, with sales forecast to rise nearly 20 percent per annum, from $14.1 million[1] in 1981 to over $34 million in 1986 (see table 1). The need for speed and efficiency in leading sectors as banking and tourism-related industries, coupled with the strong upward trend in labor costs, should mean sharply increased computer demand by Greek business. Government, military, and financial interests have installed some medium and large mainframes, but it is the availability of low-cost, versatile minicomputers that is luring many first-time commercial buyers. The market for mini's is forecast to nearly treble over the 1981-86 period, topping $16 million in the latter year. Purchases of small, medium, and large mainframe-based systems are also expected to accelerate as users develop more sophisticated data processing needs. The population of such systems is expected to more than double from 1980 to 1986 (see table 2).

Imports currently supply the entire market, though manufacture of minicomputers and peripherals is expected to total some $922,000 by 1986. American vendors captured almost 40 percent of 1981 imports with sales of $5.5 million, and shipments from European subsidiaries add to the importance of U.S. brands (see table 3). Direct sales from the States are projected at $14.1 million, or 42 percent of imports, for 1986.

The Greek manufacturing sector accounted for over half the installed computer base at the end of 1980 and for 38 percent of 1981 expenditures on computers and peripherals (see table 4). Manufacturers, especially subsidiaries of major multinational firms, tend to use computers for commercial applications such as inventory control, accounting, and financial modeling; direct computer control of industrial processes or product design is still rare in Greece. Banks and financial institutions, also major users, are forecast to boost their share of electronic data processing (EPP) expenditures from 17 percent to 18 percent over the 1981-86 period as Greek financiers strive to offer competitive customer service. Other prominent sectors that are expected to increase their purchases rapidly include retailing/wholesaling and transportation (both of which benefit from international contact with other computer users), insurance (said to be profitable and under-computerized); and government (which will need hardware to simplify Greece's labyrinthine tax system).

Major Market Trends

Computer application in Greece has broadened considerably within the past several years. As recently as a decade ago, analysts say, a 90/10 percentage breakdown described the mix of commercial and other (industrial, defense, teaching) applications. In 1980, business and commercial data processing still accounted for over 70 percent of all data processing time on mainframes and for 75 percent of mini installations (see tables 5 and 6). But as the market matures, Greek users are expected to devote more mainframe processing time and mini installations to direct industrial control, data communications, and research and teaching applications. Industry experts foresee some reversal of the cur-

Table 1.—Greece: The market[1] for computers and peripheral equipment, 1980-81 and 1986

(in thousands of U.S. dollars)

	1980	1981	1986
Minicomputers			
Production	—	—	572
Imports	4,511	5,503	15,561
Market size	4,511	5,503	16,133
Small, medium, and large computer systems			
Production	—	—	—
Imports	4,565	5,386	11,809
Market size	4,565	5,386	11,809
Peripherals (sold separately)[2]			
Production	—	—	350
Imports	2,449	3,220	6,126
Market size	2,449	3,220	6,476
Totals			
Production	—	—	922
Imports	11,525	14,109	33,496
Market size	11,525	14,109	34,418

[1] Size of market equals production (ex factory value) plus imports (c.i.f.). No exports of Greek production are projected. Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Excluding equipment sold as components of integrated computer systems.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Greece" (see Additional Information box). Figures in this report are based on data gathered in Greece, including available government statistics, industry reports, and trade source estimates and projections.

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[1] All values are shown in U.S. dollars. Local currency data for all years are converted at the exchange rate of US$1=56.6 drachmae. Values for years through 1980 are expressed in current rather than constant dollars/pices; values for 1981 and subsequent years are expressed in 1980 constant dollars/prices.

rent swing to mini's, since medium to large-scale systems will eventually be needed to control minicomputer networks and to handle the many business and administrative functions centralized in Athens.

Storage systems.—Fixed disks and removable disk and tape drives are the most common storage devices. Since Greek buyers tend to purchase too few peripherals initially, add-on storage is especially popular. Supplementary disk drives as well as extended core memories and external semiconductor memories are expected to be in demand. Little immediate potential is foreseen for magnetic bubble memories and automated mass storage systems, though the latter could prove salable in the medium term.

Data entry.—In Greece, as elsewhere, magnetic media is gaining at the expense of paper tape and cards. Most commonly used data entry devices are key-to-disk, -tape, and -diskette. Intelligent terminals with diskette or cassette data storage capable of online operation are an increasingly popular method of data entry. Retail, financial, and credit verification terminals entering data at the point of sale (POS), are also expected to find a ready market within the next few years. Use of optical character recognition (OCR), optical mark recognition (OMR), and magnetic ink character recognition (MICR) devices is limited. Data tablets for original graphic inputs have yet to find a market niche.

Output.—CRT displays, teletypewriters, and high-speed nonimpact printers offer the best sales prospects for output devices. The growing popularity of word processing software for minicomputers heightens the need for CRT output. High-speed digital plotters are net yet in demand, but industry sources see an emerging need for graphic displays.

Teleprocessing/data communications. — Teleprocessing in Greece is carried out through the facilities of the Hellenic Telecommunications Organization (OTE), the state communications authority. The volume of data processing traffic on leased lines, on the public switched telephone network, and, to a lesser degree, on the telex and telegraph networks, continues to expand steadily. The number of modems in use, about 1,400 in 1980, is expected to grow a dramatic 32 percent per annum to over 7,000 by 1986. OTE claims that limited demand has so far constrained major expansion of data communciations facilities. For example, OTE has not yet made plans to introduce a packet switched data transmission network.

The public switched telephone network is used for low-speed (1,200 bits per second) half duplex data transmission. Only about 110 modems were hooked into this network as of October 1980. Since then, OTE has initiated a popular facsimile transmission service to and from Japan using the international public switched telephone network.

Table 2.—Greece: Population of computers, by size,[1] 1980 and 1986

	1980		1986	
	Number of units	Percent of total	Number of units	Percent of total
Minicomputers	697	84.6	2,909	90.7
Small computers	76	9.2	195	6.1
Medium computers	32	3.9	64	2.0
Large computers	19	2.3	38	1.2
Total	824	100.0	3,206	100.0

[1] Computer size is based on the purchase price of the CPU, as follows: minicomputers, less than $75,000; small computers, $76,000-$150,000; medium computers, $151,000-$350,000; and large computers, $351,000 or more.

Source: See source notation of table 1.

Leased lines are most commonly used for data transmission. Leased local circuits in Athens, Salonika, and Patras account for over 85 percent of modem installations in Greece, with transmission speeds ranging from 200 to 9,600 bits per second (bps). Long distance circuits, also offering speeds of up to 9,600 bps, can be leased singly for point-to-point connections or interlinked as components of a network. In addition, OTE offers a few wideband circuits and plans to introduce international datel service in the near future. A pilot scheme for transmitting data from Australia to Greece at speeds of 1,200-2,400 bps is already in operation.

Distributed vs. centralized processing.—Though Greeks, like other computer users, have followed the trend toward distributed processing using smaller machines, centralized processing is far from dead. The role of Athens as the cultural, commercial, and administrative center of Greek life encourages the concentration of EDP activity there. Moreover, companies operating the many smaller mainframes and mini's now springing up across the country will, at some point, require hardware for centralized control. Industry observers predict a growing need for medium-sized mainframes in centralized processing for business, government, tourism, and utilities. Chief users of distributed processing are likely to be multinational firms in Greece that operate at locations throughout the country and must also maintain contact with a home office overseas.

Hierarchical networks. — Hierarchical networks for such applications as computer-aided design (CAD), computer-aided manufacture (CAM), and direct digital control of industrial processes are still rare in Greece. No major market inroads are expected before the end of the 1981-86 period.

Automated business transactions information systems.—Although the market is not ready to adopt transaction-oriented processing immediately, automated business transactions information systems are thought to offer excellent sales prospects later in the 1981-86 period. The tourist industry should spearhead use of such POS devices as credit validation terminals and travel ticketing systems. Retailers are expected to follow by mid-decade. Toll collection systems and factory data collection terminals are not expected to find much use before the end of the 1980's.

Automated banking systems.—Banks were among Greece's first computer users, and they have been quick to pick up on automated banking. Most major financial institutions have expressed interest in electronic funds transfer, and leading banks have begun installing through-the-wall cash dispensers, automated tellers for in-bank use, and data networks to serve customers in outlying areas. Much room for improvement remains, however. Over half of Greek banks still lack computer facilities of any kind, and as many as 80 percent could benefit from upgrading or the addition of supplementary hardware.

Computerized photocomposition systems.—A few photocomposers have been bought by Greek printing and publishing houses, but overall computer use in this sector is minimal. Trade sources note that printing quality is generally poor across the publish-

Table 3.—Greece: Imports of computers and peripheral equipment[1] by country of origin, 1980-81 and 1986

	1980		1981		1986	
	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)
Minicomputers						
United States	1,857	41.2	1,706	31.0	5,446	35
Germany	704	15.6	1,321	24.0	3,890	25
France	465	10.3	759	13.8	2,179	14
United Kingdom	431	9.6	552	10.0	934	6
Italy	687	15.2	517	9.4	1,556	10
Other	367	8.1	648	11.8	1,556	10
Subtotal	4,511	100.0	5,503	100.0	15,561	100
Small, medium, and large computer systems						
United States	2,065	45.2	2,001	37.2	4,960	42
Germany	864	18.9	1,154	21.4	2,598	22
France	508	11.1	809	15.0	1,889	16
Italy	340	7.5	556	10.3	1,299	11
United Kingdom	284	6.2	434	8.1	827	7
Other	504	11.1	432	8.0	236	2
Subtotal	4,565	100.0	5,386	100.0	11,809	100
Peripherals (imported separately)[2]						
United States	1,412	57.7	1,795	55.8	3,676	60
Germany	299	12.2	427	13.3	919	15
Italy	296	12.1	299	9.3	429	7
France	280	11.4	370	11.5	612	10
United Kingdom	137	5.6	136	4.2	306	5
Other	25	1.0	193	5.9	184	3
Subtotal	2,449	100.0	3,220	100.0	6,126	100
Total imports	11,525		14,109		33,496	
Total imports from U.S.	5,334		5,502		14,082	
U.S. share of total imports		46.3		39.0		42

[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

[2] Excluding equipment imported as components of integrated computer systems.

Source: See source notation of table 1.

Table 4.—Greece: Expenditures[1] for computers and peripheral equipment by major user sectors, 1980 and 1986

	1981		1986	
	Value ($ thousands)	Percent of total	Value ($ thousands)	Percent of total
Government	1,242	8.8	3,098	9.0
Manufacturing	5,375	38.1	10,429	30.3
Banking and finance	2,384	16.9	6,195	18.0
Insurance	325	2.3	1,205	3.5
Retailing and wholesaling	720	5.1	2,237	6.5
Transportation	818	5.8	2,409	7.0
Utilities	381	2.7	929	2.7
Communications	268	1.9	860	2.5
Health care	127	.9	516	1.5
Education and research institutions	578	4.1	1,721	5.0
Publishing and printing	99	.7	344	1.0
EDP service bureaus	762	5.4	1,721	5.0
Other	1,030	7.3	2,754	8.0
Total	14,109	100.0	34,418	100.0

[1] Excluding costs of software, hardware maintenance, sales commissions, etc.

Source: See source notation of table 1.

ing industry, so there is little competitive pressure to raise standards through automation.

Software and data base management systems.—In Greece, computer manufacturers supply 65 percent of software, while in-house programmers generate 5 percent. The portion of software provided by software houses is expected to grow from its current 30 percent to 40 percent by 1986.

Frequently used systems software includes basic operating packages; compilers for such languages as Assembler, Basic, Cobol, and Fortran; communications software; and utility packages. So far, only limited use is made of more advanced systems packages, such as data base management systems (DBMS), data dictionaries, and file organizers, though rapid growth is expected.

The business uses to which most computers are put explain the prevalence of commercial applications software. Applications packages are used to handle billing, auditing, accounts receivable, tax administration, pensions, purchasing, general ledger, payroll, export and import administration, word processing, banking, insurance, and hotel management. As the market evolves, increasingly sophisticated packages are likely to become popular, and users are expected to order more custom software.

Availability of EDP personnel.—Trade sources estimate Greece's computer workforce at about 12,000 in 1981. The breakdown by personnel category shows some 24 percent are managers and supervisors, 35 percent operators, 28 percent programmers, and 12 percent systems analysts and engineers. In the past, most training has been done by hardware suppliers, but several technical colleges now offer courses in computer science. Graduates currently number about 260 a year, with the level expected to rise to 400 annually by 1986. Until the supply of thoroughly trained computer specialists coming out of the new programs grows substantially, trade sources foresee continued personnel shortages as a bottleneck to more widespread computer use.

Table 5,—Greece: Percentage breakdown of total processing time of installed small, medium, and large computers[1] by end-user application 1980

	Small computers	Medium computers	Large computers
Business/commercial data processing	71	78	79
Industrial automation/ process control	6	2	1
Scientific/engineering applications	2	1	1
Military/aerospace applications	4	5	5
Data communications/ teleprocessing	7	4	4
Medical/scientific lab analysis	6	5	5
Education, instruction	4	5	5
Total	100	100	100

[1] Computer size is based on the purchase price of the CPU, as follows: small computers, $76,000-$150,000; medium computers, $151,000-$350,000; and large computers, $351,000 or more.

Source: See source notation of table 1.

Table 6.—Greece: Percentage breakdown of total installed minicomputers[1] by end-user applications 1980

	Percent of total	
Business/commercial data processing		75
Industrial control		7
Continuous process control	2	
Direct machine control	2	
Factory management	2	
Other	1	
Data communications		5
Terminal controllers	2	
Front end systems	1	
Message circuit switching	1	
Data concentrators	1	
Laboratory analysis		6
Medical sciences	2	
Other life sciences	2	
Physical sciences	2	
Other		7
Total		100

[1] Minicomputers are defined as those having a CPU priced at under $75,000.

Source: See source notation of table 1.

Competitive Environment

With minimal local production, foreign manufacturers are likely to continue supplying virtually all the needs of the Greek market. Table 7 lists major competitors and the product lines they offer in Greece. Details about the brands and models currently in use by major potential customers is available in the original market research commissioned by the U.S. Department of Commerce (see Additional Information box).

Greek EDP managers look for extensive support from experienced manufacturers, prompting most of them to turn to American vendors. As a result, U.S. brands made up over three-fourths of the installed computer base at the start of 1981 (see table 8). In addition to being the leading mainframe vendors in Greece, six prominent U.S. suppliers are among the top ten manufacturers of minicomputers. As Greek buyers develop an appreciation for plug-compatible add-ons, American-built peripherals are also expected to do well, with U.S.-sourced shipments of such items (separately sold) forecast to account for

Table 7.—Greece: Major suppliers of computers and peripheral equipment to the Greek market

U.S. manufacturers

Burroughs
  Central processors (B80 and B1700), communications processors (B800), small business system (B90 and B700), and supporting peripherals
Control Data Corporation
  Central processors (Cyber 176), minicomputers (18/12), small business systems (18/20), data communications systems (1000), and supporting peripherals
Data General
  Central processors (Eclipse C330) and supporting peripherals
Datapoint
  Small business systems (1500, 1800, 2200, 5500, 6600) and supporting peripherals
Digital Equipment Corporation
  Central processors (PDP 8, 11/34, 11/40, 11/70, VAX) and supporting peripherals
General Automation
  Central processors (16/240, 16/440, and 16/480) and supporting peripherals
Hewlett-Packard
  Central processors (1000E), minicomputers (3000/44), and small business systems (300)
Honeywell (via CII-HB)
  Central processors (64/20), minicomputers (6/43), small business systems (DPS6), and Datanet front-end processors, and supporting peripherals
IBM
  Central processors (3/15, 32, 34, 38/3, 360/40, 370/145, 4331, and 4341) and supporting peripherals
NCR
  Central processors (8230, 8250, and 8270), small business systems (8140 and 8150), banking systems (8130), and supporting peripherals
Perkin-Elmer
  Central processors (1620), minicomputers (3220), and supporting peripherals
Tandem
  Central processors (T16)
Texas Instruments
  Central processors (900/10), minicomputers (990/10), and supporting peripherals
Univac
  Central processors (90/30, 1100/60, and V77) and supporting peripherals
Wang Laboratories
  Central processors (2200 MVP, 2200 WCS, and 2200T) and supporting peripherals

Third-country manufacturers

CII-HB (France and U.S.)
  Central processors (CII-HB 61)
Diablo (Japan)
  Small business systems (3200) and peripheral equipment
ICL (United Kingdom)
  Central processors (1503/44, 1505, 2903/20, and System Ten) and supporting peripherals
Kienzle (Germany)
  Minicomputers (9066)
LogAbax (France and Italy)
  Small business systems (LX5000)
Mael (Germany)
  Small business systems (5000)
Nixdorf (Germany)
  Central processors (8870), minicomputers (8870/3), small business systems (8870/8), and information systems (8860)
Olivetti (Italy)
  Small business systems (SP600)
Philips (Netherlands)
  Central processors (P4500), minicomputers (P2000), small business systems (P7000), and supporting peripherals
Plessey (United Kingdom)
  Minicomputers (23)

60 percent of total peripheral imports in 1986.

Third-country rivals enjoy their greatest success in the market for minicomputers. German suppliers of computer systems for commercial, government, defense, or industrial use aggressively advertise their equipment, backing it with solid software support. French vendors enjoy close working relationships with their customers, while Italian and Dutch competitors have made substantial gains in the market for small business systems. U.K. manufacturers have established a presence in Greece with their early sales of ICL mainframes.

A local firm, Gigatronics, is beginning domestic assembly of small business minicomputers from imported components. So far, the company has had little success, and industry sources were unable to identify any installations of the locally built machine in 1981.

Table 8.—Greece: Cumulative number and value[1] of installed computers, by major suppliers, as of December 31, 1980

	Number of units	Value ($ thousands)	Share of total value (%)
IBM	147	12,300	21.5
CII-HB (France/U.S.)	78	5,400	9.4
Control Data	47	5,200	9.1
NCR	65	4,700	8.2
Univac	48	4,700	8.2
Wang	87	4,400	7.7
Nixdorf (Germany)	82	4,000	7.0
ICL (U.K.)	52	3,800	6.6
Burroughs	56	3,600	6.3
LogAbax (France)	36	1,400	2.4
Olivetti (Italy)	31	1,400	2.4
Philips (Netherlands)	17	900	1.6
Others	78	5,500	9.6
Total	824	57,300	100.0

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

Source: See source notation of table 1.

Additional Information

The project officers responsible for Country Market Surveys on Computers and Peripheral Equipment are:

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The Survey summarizes a 103-page International Market Research (IMR) report prepared by Tactical Marketing Limited, London, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Greece and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk Telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Computers and Peripheral Equipment in Greece," ITA 82-08-503, April 1982.

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Greece

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Country Market Survey

Industrial Process Controls

Greece

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Investments to modernize and enhance the efficiency of Greece's existing production facilities are expected to boost spending for process controls by 6.7 percent a year over the 1980-86 period. The market for control instrumentation is projected to grow from $5.7 million[1] to $8.4 million a year (see table 1 and figure). Demand for industrial process controls remained strong in 1979-81 despite the economy's general recession. With Greece's entry into the European Economic Community (EEC) in 1981, the need to improve industrial productivity has become an urgent and widely recognized concern. In the major process industries, many factory managers are planning to upgrade instrumentation, and some of the largest firms are moving to computer controlled systems. Purchases to update and expand existing installations account for three-fourths of Greek process control spending. Imports supply the entire market; U.S. sources are among the major suppliers, providing 25 percent of imports in 1980 (see table 2).

Sales of electronic/electric instruments are forecast to increase well above the market rate, averaging nearly a 9 percent annual rise in 1980-86, bringing a total of $4 million in 1986. Extended use of these instruments is anticipated in plant modernizations, particularly in the chemical, petroleum, and cement industries. Demand for control valves should be similarly influenced; sales are projected to double over 1980-86, providing a $1 million market in 1986. Less demand for nonelectronic/nonelectric instruments is anticipated; sales are forecast to increase about 5 percent a year, yielding receipts of $2.4 million in 1986. The market for process control computers and peripherals should continue at about $1 million a year through 1986. For the present, Greek industrialists regard these systems as suitable chiefly for large-scale units operating with continuous processes, most common in the chemical, oil refining, and cement industries.

Trade sources report the actual value of Greek process control purchases is considerably greater than indicated by the above market data. They attribute this situation to the general practice of including the original instrumentation for most new industrial facilities and major plant expansions in turnkey contracts with foreign engineering firms. Instruments imported in this manner have not been included in the Greek market statistics.

Table 1.—Greece: The market[1] for industrial process controls, 1979, 1980, 1981, and 1986

(in millions of U.S. dollars)

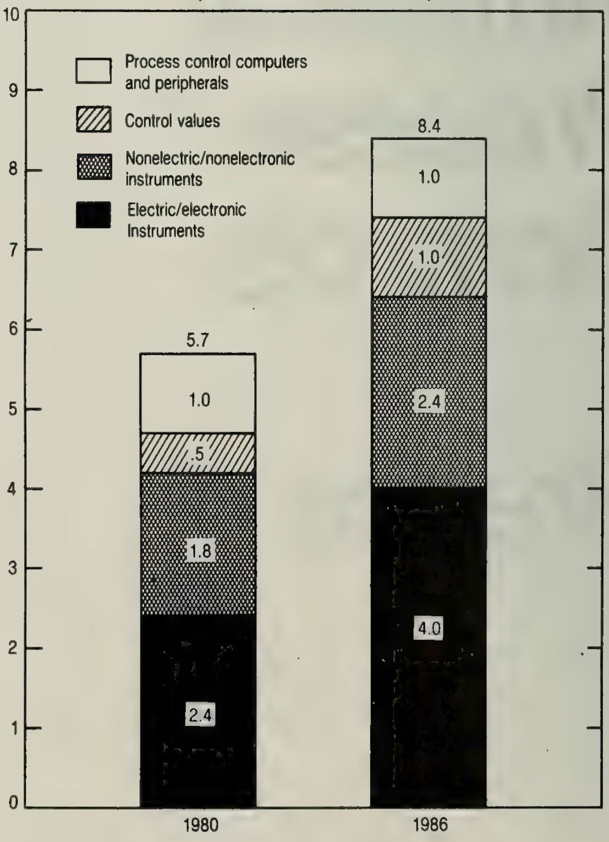
	1979	1980	1981	1986
Electronic/electric instruments	2.0	2.4	2.5	4.0
Nonelectronic/nonelectric instruments	1.7	1.8	1.9	2.4
Control valves	0.5	0.5	0.6	1.0
Process control computers and peripherals	1.0	1.0	0.9	1.0
Total Market Size	5.2	5.7	5.9	8.4

[1] The market for industrial process controls in Greece is supplied entirely by imports. Part are excluded.

Source: International Trade Administration, Office of Trade Information Services research report. See Additional Information box.

Greece: The market for industrial process controls, 1980 and 1986

(in millions of U.S. dollars)



Source: International trade Administration, Office of Trade Information Services research report.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=37 drachmae (1979), 44 drachmae (1980), and 56 drachmae (1981 and subsequent years). Values through 1981 are expressed in current rather than constant dollars; values for 1982 and subsequent years are expressed in 1981 constant dollars.

Competitive Environment

As Greece has no domestic production of process control instrumentation, projections for imports coincide with market size forecasts. Third-country sources account for about 75 percent of imports. The market share held by American manufacturers is expected to rise to 27 percent in 1986 as U.S. sales advance from $1.4 million to $2.3 million a year. However, the use of U.S. brand instrumentation is substantially greater, since European subsidiaries of several American companies are among the important third-country suppliers to this market.

U.S. Suppliers.—About 40 percent of the electronic/electric process control instruments sold in Greece are of U.S. origin. Sales of these instruments, representing about 70 percent of U.S. imports, are expected to increase more than 9 percent a year in the first half of the decade, rising to $1.6 million in 1986. American manufacturers are forecast to double their sales of control valves in 1980-86; imports from U.S. sources supply about 30 percent of this market segment. Trade sources indicate that obtaining orders for complete computer systems could boost U.S. sales of process control computers and peripherals well above the $100,000 projected for 1986. According to trade reports, the best sales prospects over the next few years for U.S. suppliers are in sensing and measuring instruments for temperature, pressure, flow, and liquid level, as well as on-line chemical composition analyzers appropriate for pollution control applications.

Table 2.—Greece: Imports of industrial process controls by country of origin, 1980 and 1986

(in thousands of U.S. dollars)

	1980	1986
Electronic/electric instruments		
United States	950	1,600
Germany	1,100	
France	200	
Other	150	
Subtotal	2,400	4,000
Nonelectronic/nonelectric instruments		
United States	200	270
Germany	600	
United Kingdom	350	
Other	650	
Subtotal	1,800	2,400
Control valves		
United States	150	300
Germany	200	
Netherlands	100	
Other	50	
Subtotal	500	1,000
Process control computers and peripherals		
United States	100	100
Netherlands	900	
Other	—	
Subtotal	1,000	1,000
Total	5,700	8,400

Source: International Trade Administration, Office of Trade Information Services research report.

Technical suitability, reliability, and durability are the qualities that Greek buyers expect from U.S.-made process controls. Price has not been a major consideration in the sale of American products. Many instruments from U.S. sources have proven particularly well suited to the design standards and specifications required in the Greek petroleum industry.

Other foreign suppliers.—German and Dutch sources are the major third-country suppliers. German manufacturers provided about a third of imports in 1980, registering sales of $1.9 million. German strengths are in electronic/electric instruments, where they held a 46 percent market share in 1980, as well as in nonelectronic/nonelectric instruments, a 33 percent share. German instrumentation has proven well suited to the requirements of Greece's cement and power industries. With sales of $900,000, Dutch manufacturers were the leading suppliers of process control computers and peripherals in 1980. French and British manufacturers are also well established in this market.

Major Industrial Users

Greece's 10 major process industries in 1979 boasted combined output valued at $11.9 billion (see table 3). Total demand for processed and manufactured goods stood at $27.6 billion in 1980, after increasing an average of nearly 15 percent a year during the 1970's. Capacity utilization among Greek process industries ranged from 60 to 85 percent in 1980. Government efforts to combat inflation through its Five-Year Development Program (1983-87) are expected to slow growth during the next few years. Increases in industrial output are projected to average 2.6 percent a year from 1979, reaching $14.3 billion in 1986. Over the same period, capital expenditures in these industries are forecast to rise from $1.7 billion to just over $2 billion.

The chemical, petroleum, and glass/cement/ceramic products industries are the largest end-users. Their purchases, which are forecast to increase more than 10 percent a year through 1986, should account for about 75 percent of the market for industrial process controls in 1986 (see table 4). Demand from these industries is generally based

Table 3.—Greece: Output and capital expenditures of industries using process controls, 1979 and 1986, and percent of plant capacity utilized, 1980

(in millions of U.S. dollars)

	Output[1]		Capital expenditures[2]		Percent of plant capacity utilized
	1979	1986	1979	1986	1980
Oil and gas extraction	—	370.0	35.0	20.0	—
Food and kindred products	2,019.4	2,430.2	236.6	284.7	60
Textile mill products	1,964.6	2,199.7	191.3	214.2	65
Pulp and paper	332.4	481.9	81.0	117.4	70
Chemicals	1,369.9	1,602.5	57.9	67.7	75
Petroleum	3,088.6	3,381.7	100.8	110.4	63
Rubber/plastic products	487.0	489.0	46.0	46.2	75
Glass/cement/ceramic products	1,056.1	1,464.6	180.1	249.7	80
Primary metals	1,061.4	1,187.1	96.7	108.2	65
Electric/gas/sanitary services	551.9	667.6	684.3	827.4	85

[1] Exfactory sales values.

[2] Plant and equipment expenditures for 1979 and 1986, alone.

Source: International Trade Administration, Office of Trade Information Services research report.

on programs to upgrade and modernize existing facilities. Direct replacement purchases represent less than 20 percent of expenditures in the chemicals and petroleum industries and only a slightly larger portion of outlays in plants manufacturing glass/cement/ceramic products.

Chemicals industry.—In addition to basic chemicals, Greek manufacturers also produce acids, fertilizers, plastic materials, synthetic fibers and resins, paints, pharmaceuticals, cosmetics, and detergents. Overall output increased about 5 percent a year during the late 1970's, bringing the aggregate value to $1.4 billion in 1979. The industry's 1,095 enterprises employ a total of some 26,000 workers. The eight largest chemical producers each have more than 500 employees, and another 39 large firms employ between 100 and 500 workers. Capital expenditures by chemical manufacturers, nearly $58 million in 1979, are projected at $67.7 million in 1986, when the industry's total output is forecast to reach $1.6 billion.

Chemical manufacturers led all end-users in expenditures for process controls in 1980 and are expected to provide a market worth $2.3 million in 1986. The most important customers will be the fertilizer manufacturers that plan major investments during the next few years. Hellenic Chemical Products and Fertilizer Company, the industry's 1979 sales leader, plans to modernize a fertilizer plant built in 1930. Annual capacities at this plant are presently 90,000 tons of compound fertilizers, 10,000 tons of superphosphate fertilizers, and 350,000 tons of mixed phosphate-sulphate fertilizers SING intends to upgrade its compound fertilizer and calcium ammonium plant built in 1965. AEVAL expects to spend $27 million to increase production capacity for ammonia (to 470 tons per day) and augment other capacities by 10 percent. Phosphoric Fertilizers recently completed a $45 million expansion program to double fertilizer capacity (to 700,000 tons a year) and add ammonium nitrate (200,000 tons a year) and nitric acid (150,000 tons a year) units.

Several other large projects that will include major outlays for process controls have been pending for some time at Government-owned chemical companies. These include a new petrochemical complex planned by Greek Petrochemicals, which has been delayed by environmental concerns, and a $230 million ammonia plant to be constructed by EVIAM.

Petroleum industry.—The petroleum industry recorded production increases of 3.7 percent a year in the last half of the 1970's and boosted output over the $3 billion mark in 1979. But output was well below capacity in 1980, and major investments to expand facilities are not anticipated in the near future. Output is forecast to reach $3.4 billion in 1986, while capital expenditures are expected to stabilize at about $100 million a year. Most of the industry's 123 firms are small-scale undertakings; only eight enterprises employ more than 100 workers. In total the petroleum industry employs some 4,700 workers. Oil refineries are the industry's major users of process controls. Two refineries, Hellenic Aspropyrgos (capacity of 4.5 million tons) and Thessaloniki (3.2 million tons), supply the Greek market while the facilities operated by Petrola Hellas (4.5 million tons) and Motor Oil (7 million tons) export most of their production. The Motor Oil refinery is considered the most modern in Greece. A recent upgrading of control instrumentation at Thessaloniki included installation of two process control computers. Both the Hellenic Aspropyrgos and Petrola Hellas plants are regarded by trade sources as in need of modernization and new process controls. For the entire petroleum industry, expenditures for process control instruments are forecast at $2 million in 1986.

Glass/cement/ceramic products industry.—The glass/cement/ceramic products industry also expanded rapidly during the late 1970's, increasing production by an average of 9.5 percent a year and bringing total output to $1.1 billion in 1979. The industry consists of 5,280 enterprises, 95 percent of them employing fewer than 20 workers. Employment for the industry totals 39,500 workers. The industry operated at a relatively high 80 percent of capacity in 1980 and is forecast to expand output by nearly 5 percent a year through 1986. A similar rate of increase is predicted for capital expenditures, bringing these investments to $250 million in 1986. Cement manufacturers are spearheading this growth; in the 1975-79 period, cement production increased 52 percent, to 12 million tons, and exports, chiefly to Middle Eastern countries, rose 75 percent to 4.9 million tons. The 23 companies that produce cement are this industry's most important users of process controls. The four major cement companies, Heracles General, Titan, Halkis, and Halyps, operate a total of eight plants. At Heracles General's Volos plant (annual capacity of 4 million tons), a small computer has been installed for process control. Upgrading of controls for existing facilities, increases in plant capacity, and conversion of cement factories from fuel oil to coal should spur demand for process control instrumentation during the next few years. Overall, the glass/cement/ceramics industry is expected to spend $2 million for this instrumentation in 1986.

Other industries.—The gas and oil extraction industry in Greece provides a small but rapidly growing market for process control instruments. Purchases for this industry are forecast to expand 26 percent a year during the 1980-86 period. The textile industry ranked among the major purchasers of instrumentation in 1980, spending $1 million. Included in 1980 outlays was a computer acquired by PIRAIKI-PATRAIKI, Greece's largest textile manufacturer, for use with its new fully automated finishing and dyeing operation. As there are few other large firms in the textile industry, additional purchases of this magnitude are not anticipated, and lower levels of expenditures for process controls are projected for the early 1980's.

Market Access Data

Foreign engineering firms specify and purchase the process controls required for most new industrial facilities and major plant expansions. Appli-

Table 4.—Greece: The industrial process controls market by user industries, 1980 and 1986

(in thousands of U.S. dollars)

	1980			1986		
	New installations	Replacements	Total	New installations	Replacements	Total
Oil and gas extraction	50	—	50	100	100	200
Food and kindred products	200	50	250	320	80	400
Textile mill products	900	100	1,000	300	200	500
Pulp and paper	150	100	250	150	100	250
Chemicals	1,100	200	1,300	1,950	350	2,300
Petroleum	900	200	1,100	1,650	350	2,000
Rubber/plastic products	100	—	100	100	—	100
Glass/cement/ceramic products	800	300	1,100	1,600	400	2,000
Primary metals	100	100	200	100	100	200
Electric/gas/sanitary services	—	300	300	—	400	400
Process machinery/equipment manufacturing industries			50			50
Total	4,300	1,350	5,700	6,270	2,080	8,400

Source: International Trade Administration, Office of Trade Information Services research report.

cations engineering services are generally provided directly by foreign manufacturers for process controls to be used to update, replace, or extend existing installations. Local representatives provide these services for relatively simple installations and, when necessary, they also train the customer's personnel.

Greece has no regulations or specifications applicable to industrial process controls. The metric system is used in Greece, and instruments calibrated in metric units are preferred by end-users.

For most types of process controls, Greek customs duties have already been aligned with those of the EEC; by 1986 all Greek duties will conform to the Community's standards. Process controls from EEC sources enter Greece duty free: imports from other sources are subject to duties ranging from 6.5 percent to 14.5 percent. All imported instruments, including those from EEC sources, are subject to a 6 percent turnover tax, a 4.8 percent stamp duty, and other charges that range from 1 percent to 3 percent.

The Greek Government welcomes foreign involvement in achieving its development goals. Joint ventures are encouraged under a new law passed to support the regional development goals of the 1983-87 Development Program. The Ministry of Coordination will publish a list of joint venture opportunities, and will evaluate proposed investments in terms of job creation, export promotion, import substitution, energy conservation, technological advancement, and environmental protection.

Additional Information

The project officer responsible for Country Market Surveys on Industrial Process Controls is:

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This Survey summarizes a 56-page International Market Research (IMR) report prepared by ICAP Hellas S.A. in Greece under contract to the U.S. Department of Commerce, and reflects the opinions and views of interviewees in Greece and not those of the Department of Commerce. A copy of this report may be purchased from:

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Telecommunications
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.S. DEPARTMENT OF COMMERCE
nternational Trade Administration

The Greek market for telecommunications equipment is projected to grow at a steady 8 percent per annum from $133 million[1] in 1980 to $212 million in 1987 (see table 1). Approximately two-thirds of 1980 sales were accounted for by telephone and telex equipment and this percentage is unlikely to change. Transmission equipment sales accounted for 25 percent of the market in 1980 and should rise modestly throughout the period. Demand for mobile radio and data communications equipment is expected to increase rapidly, while sales of video and audio equipment should decline from the extraordinary levels of 1980 when the SECAM color television system was installed.

The purchase, installation, and maintenance of all telecommunications equipment in the nation is under the control of the Hellenic Telecommunications Organisation (OTE). Responsibility for video and audio broadcasting equipment belongs to another state organization, Hellenic Radio-Television. It operates two radio/television networks: ERT I, which serves the entire country, and ERT II, the former Armed Forces Information Service.

Table 1.—Greece: The market for telecommunications equipment, 1979-80 and projected 1987

(in millions of U.S. dollars)

	1979	1980	Projected 1987
Telephone and telex equipment			
Local production	42.7	40.8	48
Imports	40.1	63.6	124
Exports (less)	19.1	17.1	22
Total	63.7	87.3	150
Transmission equipment[1]			
Local production	—	—	—
Imports	12.2	19.5	26
Exports (less)	—	—	—
Total	12.2	19.5	26
Telecommunications wire			
Local production	25.0	32.0	45
Imports	2.6	4.5	6
Exports (less)	8.3	10.7	15
Total	19.3	25.8	36
Total market			
Local production	67.7	72.8	93
Imports	54.9	87.6	156
Exports (less)	27.4	27.8	37
Total	95.2	132.6	212

[1] Includes mobile radios, video and audio broadcasting equipment, and data communications equipment.

Source: International Trade Administration, Office of Trade Information Services research study, "Market Research Survey on Communications Equipment in Greece" (see Additional Information box).

Competitive Environment

Imports supplied 58 percent of the telecommunications equipment market in 1979 and 66 percent in 1980. By 1986, foreign vendors are expected to account for 74 percent of sales as demand increases for technologically advanced devices. France, which has long enjoyed special economic and political relations with Greece, and West Germany are the major trading partners.

Greece became a full member of the European Economic Community (EEC) in 1981, conferring advantages to manufacturers within the Community over those from other parts of the world. The position of European suppliers will be further strengthened by the $99 million loan granted by the European Investment Bank (Banking Institute of the EEC) to OTE for the modernization and expansion of Greek telecommunications. Outside the EEC, the primary sources of equipment are East Germany (very strong in all types of switches and panels), Romania, and Japan.

U.S. vendors command only a minor share of the market, about 3 percent of total imports in 1980. However, the percentage varies greatly from category to category—about 1 percent of telephone and telex equipment imports and 8 percent of transmission equipment and other high-technology products. Telecommunications equipment of U.S. origin enjoys a favorable image among all end-users; most claim that it is technologically more advanced and durable than that from Europe or Japan. Still, membership in the EEC combined with the expensive U.S. dollar and high freight costs have hindered U.S. suppliers.

Domestic output of telecommunications equipment, forecast to rise from $73 million in 1980 to $93 million in 1987, comprises locally manufactured telephone sets and cables, and switching systems assembled from imported parts. The 20 firms in the industry employ 4,300 people. Although the OTE favors companies operating in Greece, its demands are insufficient to support large establishments, and the industry can develop only through joint ventures

Source: "Market Research Survey on Communications Equipment in Greece," Middle East Marketing Research Bureau, P.O. Box 2098, Telex 2488, Tel. 45413, Nicosia, Cyprus, June 1982 prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box).

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[1] All values are shown in U.S. dollars; local currency data are converted at the following exchange rates: US$1=36.8 Drachmas (1977), 36.7 Drachmas (1978), 37.0 Drachmas (1979), 42.6 Drachmas (1980), and 63.4 Drachmas (1981 and subsequent years). Values for the years through 1981 are expressed in current rather than constant dollars for 1982 and subsequent years are expressed in 1981 constant dollars.

with or direct investment by foreign companies; no such projects are underway currently. The Government is highly supportive of local industry and especially promotes export development through subsidies and customs protection. Exports, projected to increase from $28 million in 1980 to $37 million in 1987, account for 40 percent of production.

Product Market Profiles

Telephone and telex equipment.—The market for telephone and telex equipment is projected to rise from $87 million in 1980 to almost $150 million in 1987. The import share has been increasing—from 63 percent in 1979 to 73 percent in 1980—and is forecast to account for nearly 85 percent of sales in 1987. Local firms are unable to keep pace with technological developments, and advanced equipment must be imported (see table 2).

Table 2.—Greece: Imports of telecommunications equipment by country of origin, 1978-80 and projected 1987

(in thousands of U.S. dollars)

	1978	1979	1980	Projected 1987
Telephone and telex equipment				
United States	512	839	815	4,000
France	782	3,870	19,657	
West Germany	13,525	13,893	12,410	
East Germany	9,980	11,744	11,794	
Romania	1,341	729	5,365	
Italy	3,124	4,063	4,798	
Canada	37	1,026	3,385	
United Kingdom	539	194	1,555	
Japan	1,432	1,255	991	
Other	1,818	2,507	2,788	
Total	33,090	40,120	63,558	124,000
Transmission equipment				
United States	1,506	2,761	1,818	4,600
France	532	1,789	11,059	
West Germany	628	1,580	1,824	
United Kingdom	1,059	2,171	1,290	
Italy	206	1,190	1,090	
Japan	944	1,249	843	
Denmark	765	437	751	
Belgium	657	546	497	
Other	390	467	290	
Total	6,687	12,190	19,462	26,100
Telecommunications wire				
United States	40	70	40	150
West Germany	800	970	1,710	
Italy	580	750	950	
France	440	240	620	
Belgium	10	50	220	
Netherlands	90	90	160	
Romania	10	—	140	
Austria	40	70	130	
Sweden	—	10	130	
Other	340	370	430	
Total	2,350	2,620	4,520	6,400

Source: OECD Export Statistics, Greek import statistics, and International Trade Administration, Office of Trade Information Services research study, "Market Research Survey on Communications Equipment in Greece."

OTE is currently replacing all its switching systems with digital equipment, which should keep sales at a high level (see table 3). The switching market is dominated by the local manufacturing subsidiaries of four foreign companies—Siemens and Standard Electrik Lorenz of West Germany, Philips of the Netherlands, and the East German RFP. The four companies each account for at least 15 percent of the market and together control almost 90 percent. Siemens, Philips, and Standard Electrik Lorenz account for 80 percent of the toll office systems market, with GTE Sylvania (United States), NEC (Japan), and Plessey (United Kingdom) sharing the remainder about equally.

Imports of commutating and multiple switchboards—$27 million in 1979 and $49 million in 1980—consisted mainly of parts to be assembled in Greece. Over half the shipments came from East and West Germany, with sales by U.S. firms totaling only $418,000 in 1980. Significant sales were also made by vendors in Romania, France, the Netherlands, and Canada.

The Greek telecommunications system is steadily and rapidly expanding, creating a continuous demand for telephone sets, private branch exchanges (PBX's), and coin-operated telephones. Siemens Hellas controls about 60 percent of the market for telephone sets, Standard Electric Hellas follows with about 30 percent, and Philips Hellas, Intercom S.A. (the RFP subsidiary), and various others share the remainder.

The market for PBX's is divided more equally: Siemens provides 30 percent; Standard Electrik Lorenz and L. M. Ericsson (Sweden) each furnish 15 percent; Plessey has 10 percent; and Philips and Western Electric (United States) have 5 percent each. Oki of Japan recently increased its market share to 20 percent. Standard Electric Hellas supplies 90 percent of the key systems, while Oki and NEC account for 5 percent each. Tamra (Japan) accounts for 90 percent of the coin telephone sales; local manufacture supplies the remainder. Slow scan video sets, picture phones, and subscriber protection equipment have yet to be introduced in Greece.

The use of facsimile equipment is just beginning, with installations found mainly in branches of multinational corporations. Toshiba supplies about 80 percent of these devices. Recording and answering equipment is supplied by Philips, Racal (United Kingdom), Dictaphone (United States), and several Japanese firms. A few shipping companies have automatic dialers, and the market appears to be growing steadily. Intercom systems are supplied primarily by Japanese concerns and Siemens. Station accounting systems, as well as call restrictors, are usually built into the PBX's. Encrypters are purchased by the military. Other telephone and central office equipment such as signaling, circuit conditioning, and outside plant cable accessories are of varied origin and sold almost exclusively to the OTE.

Telex services increased rapidly to 12,185 subscribers in 1980, and a 10-percent annual increase is anticipated over the next 5 years. OTE will have to install a number of new exchanges to accommodate new subscribers and international circuits. Teleprinters are supplied by five approved companies: SAGEM (France), Siemens, Standard Electrik Lorenz, Olivetti (Italy), and Oki. This quintet is invited to submit an offer in every call for bids. If their offers are unsatisfactory, OTE invites participation by other companies which, if allowed, permits the other company to join the group on a permanent supplier basis. The situation is different for switching equipment where Siemens has a share of about 70 percent; Standard Electrik Lorenz and SAGEM share the remainder.

Transmission equipment.—The Greek telecommunications system relies on wire and cable, but high-frequency (hf) radio and digital microwave equipment are also in great demand. One lightwave system, supplied by Siemens, is operating on an experimental basis in Athens; if satisfied, OTE may soon adopt such equipment to increase the quality of its services while decreasing its costs. OTE has no plans to install pulse-code modulation multiplexers in the immediate future.

Local manufacturers, with a combined total of 2,500 employees, supply metallic and carrier trunks. The leading firm, Fulgor Greek Electric Cable Co. S.A., is a joint venture between Fulgor SA of Italy and Greek industrialists. The two other major producers, both completely Greek owned, are Chandris Cables S.A. and Manuli Hellas Cables Industry S.A.

Coaxial cables have to be imported. Siemens supplies about 90 percent of the market; Telefunken (West Germany) has been responsible for the remainder. Cintra (France) is an important supplier of other cable and wire.

The market for hf radios is mainly controlled by U.S. manufacturers such as Collins, Aerocom, and Willcox. Philips, Marconi (United Kingdom), NEC, Lagier (France), and Storno (Denmark) are also active.

Microwave equipment is supplied by Telettra, GTE Sylvania, Storno, Standard Electrik Lorenz, Oki, and NEC. Siemens provides OTE with frequency division multiplexers, while RFP supplies both frequency division and time division multiplexers. Telettra and Plessey also market multiplexers successfully in Greece.

Table 3.—Greece: The market for telecommunications equipment by product category, 1980 and projected 1987

(in units)

	1980	Projected 1987
Telephone and telex equipment		
Switches and switching systems		
Local office systems	30	42
Toll office systems		
Trunk circuits	5,645	11,000
International circuits	216	1,100
Subscriber/user premises equipment		
Private branch exchanges		
Automatic telephones	132,687	258,600
Coin operated telephones	2,795	5,450
Telex equipment		
Teleprinters	2,192	6,300
Circuits	673	1,300
Transmission equipment		
Wire and cable		
Local	2,922 km	5,700
Carrier trunk and coaxial cables	982 km	1,900
Wireless circuits	2,272	4,400
Microwave terminal pairs	72	140
Lightwave	1	—
Multiplexers	154	300

Source: International Trade Administration, Office of Trade Information Services research study, "Market Research Survey on Communications Equipment in Greece."

Mobile radio equipment.—Demand for mobile radio equipment is expanding rapidly, sparked by an elaborate project proposed by NEC for mobile telephony. In addition, the use of paging systems is rising, and the Ministry of Communications is considering the installation of mobile radios in all Greek taxis, providing a market for tens of thousands of units.

Motorola (West Germany) supplies approximately 85 percent of the market for vehicular mobile radio; RCA, Oki, and General Electric share the remainder. Motorola also leads in personal mobile radio sales with a share of about 60 percent. RCA, Pye (United Kingdom), Oki, and Toshiba equally split the remaining 40 percent. Storno, Oki, and Pye share the market for base station equipment.

The Dutch companies Nira and Philips own approximately 70 percent of the market for paging systems; Siemens and NEC are the main competition. Marine communications equipment is furnished primarily by Motorola, Marconi, Philips, Racal, Standard Electrik Lorenz, and Japan Radio.

Aerocom and Nardeux (France) share about 70 percent of the market for VHF transmitters; the remainder is divided between Pye and PAE of the United Kingdom. Tadiran (Israel), ICE (United States), and ITT are the main suppliers of VHF transmitters.

Video and radio broadcasting equipment.—The Greek color television market is controlled by the French as the result of introduction of the SECAM system by Thomson CSF; otherwise competition is fierce. U.S. manufacturers have the largest share of the market for video studio equipment, including video tape recorders, video monitors, and special effects generators. American vendors are in a good position to supply television broadcasting transmitters, antenna towers, and video studio equipment to the soon-to-be-introduced Greek regional television. Another major project offering high sales potential to U.S. manufacturers is the third television channel, scheduled to go on the air in 1983.

End-users in the video studio field are found in both the public and private sectors. Because Thomson is responsible for the color television networks, it supplied all the consoles used in the public sector and also provided 90 percent of the cameras; 10 percent was provided by Ampex. Ampex is the leading supplier of this equipment in the private sector, while Thomson CSF, Link, and Tektronix control smaller shares.

Ampex supplied about 80 percent of the video tape recorders for the public sector; Sony supplied the remaining 20 percent. The private sector is similarly divided. Special effects generators are usually built into the consoles; Tektronix, Ampex, and Thomson are the major public and private sector suppliers of this equipment when it is sold separately. Television standard converters are supplied by Bosch and Fernseh (West Germany). Of the country's eight mobile TV vans, four were supplied by Thomson CSF, two by Ampex, and one each by RCA and Philips.

The VHF television broadcasting transmitters of the Greek Radio and Television (ERT) were purchased from Selenium (Italy); the UHF counterparts were supplied to the military by Fuba (West Germany). Antenna towers were supplied by Fuba, Selenium, and Siemens.

Hospitals, banks, and most big companies use closed circuit television systems. Philips sold approximately 90 percent of the systems currently installed; Grundig and RCA supplied the rest.

U.S.-made radio studio equipment, such as consoles, recording and playback equipment, speakers, and audio amplifiers, is highly regarded in Greece. Most of the studio consoles now in use were purchased from Siemens, Ampex, and Neve. Ampex supplied virtually all recording and playback equipment. AKG, Bayer, Philips, and Ampex are the major microphone vendors. Ampex and Siemens lead in the speakers market, with a small share going to East Lake. EMT (United States) is the main supplier of turntables; two other American companies—Soundtrack and Fisher—sell audio amplifiers; however, this equipment is usually built into the consoles. Siemens and Selenium are the main suppliers of radio broadcasting transmitters for both ERT and the Armed Forces Information Service.

Data communications equipment.—OTE will soon have full access to EURONET, which uses the X25 communications protocol based on packet switching employed by all European PTT's. Many banks and major companies have already installed modems to improve the quality of services and reduce costs. An annual increase of 20 percent in sales of modems is anticipated between 1980 and 1987 in a market sector dominated by U.S. suppliers. Codex commands 60 percent of the market; Racal Milgo (United Kingdom) has about 30 percent; and Atlantic Research (United States) and Gandalf (Canada) supply the remainder.

Codex is the leading supplier of concentrators with about 95 percent of the market. Switching equipment as well as multiplexers are again supplied by Codex along with two other American companies, T-Bar and Dynatech. Support equipment is provided by Racal Milgo, Codex, Dynatech, and Halcyon; modem eliminators come from Dynatech and Racal Milgo; and Racal Milgo, Codex, Halcyon, and Dynatech sell line drivers.

Communications test and measurement equipment.—Demand is growing for communications test and measurement equipment, particularly line analyzers, spectrum analyzers, microwave link analyzers, frequency synthesizers, level meters for telephone and broadcasting systems, and configuration meters for multiplexers. The telecommunications department of the Civil Aviation Authority has expressed an interest in oscillographs, oscillators, and signal generators.

The local industry is not prepared to build these instruments, and most of them are imported from the United States. Halcyon, Dynatech, Rhode, and Schwarz (West Germany) are the leading suppliers of data scopes and line analyzers. RCA and Hickok supply oscillators, Heathkit (United States) accounts for signal generators and oscillographs, and Siemens is among the important providers of level meters for telephone and broadcasting systems as well as configuration meters for multiplexers.

Satellite transmission equipment.—Satellite transmission is handled by the international communications network division of OTE. Communication with far distant nations is established by means of satellite, while cable and microwave equipment is used to communicate with Mediterranean nations. The international communications system was provided by ITT (United States).

The one earth station functioning at present is the 2 Standard A Earth Station at Thermopylae. It is equipped with two Intelsat Standard A antennas—one covers the Indian Ocean and another covers the Atlantic. A third Standard A antenna is currently being installed for the Intelsat system for operation with the Major Path Atlantic Ocean Region satellite. The contract for the extension was awarded to NEC. A new earth station will be built at Nemea, Peloponnese, by 1986, capable of accommodating three antennas, one of which will be for the Intelsat regional system.

Demand for satellite circuits is buoyant: 103 circuits were installed in 1980 and growth is expected to average 20 percent per annum through 1987. No domestic or regional network exists. Data collection platforms and Single Channel Per Carrier (SCPC) devices are likewise absent. Thin route terminals exist, but only for military use. No opportunity exists for the establishment of a private sector earth station in the near future.

Services.—All major end-users (both organizations and authorities) have their own specialized telecommunications departments which deal with feasibility studies, system design, and maintenance. The supplier is responsible for the installation and maintenance of the equipment as well as training of personnel (both operators and technicians).

The need for consultants and other services relating to telecommunications equipment is rather limited. In some cases, OTE has called on experts of the International Telecommunications Union, mainly for the elaboration of technically advanced projects.

End-User Analysis

The State is so dominant as purchaser of telecommunications that the private sector accounts for little more than 5 percent and is limited to buying specialized subscriber appliances and data communications equipment. From the vendors' point of view, therefore, the various public sector companies and organizations are the real end-users.

Hellenic Telecommunications Organisation.—OTE was established in 1949 to take over all telecommunications activities in Greece, which were in private hands until then. It is a limited company and operates as an independent body, but all shares and stock belong to the Greek Treasury. The government-appointed Board of Directors is supervised by the Ministry of Transport. The OTE monopolizes all telephone and radio communications—both domestic and international—with a workforce of over 30,000 (one of the largest in Greece) in 1980. Operating income that year was $54 million.

OTE is organized into several directorates, including development (responsible for planning, research, training, and organization), investments (in charge of all projects), administration and economic affairs (responsible for personnel, administration, accounts, purchasing, and data processing), and legal affairs.

Operations are divided two ways: general purpose departments specifically maintenance, telephone directories, telecommunications traffic, and customer relations; and regional departments covering Athens, Northern Greece, Central Greece, the Islands, and Southern and western Greece. The regional departments are further subdivided into area divisions that oversee maintenance and operation of the system in their areas.

In 1980, Greece had 2,796,435 main and extension telephones (see table 4). The installed capacity of local telephone switching systems was 2,544,000 of which 2,270,000 were occupied (a rate of 89 percent). The average density was 29 per 100 inhabitants, but most telephones were concentrated in the Athens area. In the smaller towns and rural areas, the density is still very low. The number of telephones in operation rose by 7 percent between 1976 and 1980, while density increased by 5 percent during the same period. Rotary dial units account for 85 percent of the telephones, push-button 15 percent.

In 1980, the number of telephone switching systems totaled 3,711, an average annual decrease of about 1 percent as automatic replaced manual. The number of installed new connections grew steadily up to 1979; however, new installations are still lower than applications. In 1980, requests were received for 225,000 automatic connections and 13,000 manual for a total of 238,000; only 175,000 were installed.

Applications for telex increased 8.8 percent annually between 1976 and 1980, and the number of installed teleprinters rose by 13 percent. An average annual growth of 42.5 percent in the number of installed data terminals was recorded between 1976 and 1980; the number rose by 79 percent in 1979.

Broadcasting.—Greece has two radio and television broadcasting corporations—ERT I, the State Greek Radio and Television, and ERT II (formerly YENED, the Armed Forces Television Network). Recently, the Government decided to create a unified radio and TV corporation under one board, while keeping the two channels operating separately.

The most important recent development was the decision to introduce regional television and add a third TV channel (at first in the Athens area only). A local network will be established to cover Northern Greece from Salonika. The Salonika station will

Table 4.—Greece: Statistics on telecommunications network

Telephones:	Number (in thousands)	Density per 100 inhabitants
1976	2,180	23.83
1977	2,319	25.07
1978	2,488	26.55
1980	2,796	28.89
Installed lines (1980)		
Private sector	2,159,000	
Public administration	27,000	
Subscriber coin-operated	35,000	
Public use telephones	19,000	
Free lines for other services	14,000	
Permanently leased trunk circuits		
Telephone	794	
Telegram	248	
Data transmission	93	
Radio broadcasting	81	
TV broadcasting	25	
Total	1,241	
International telephone circuits		
Microwave	1,343	
Satellite	347	
Submarine cables	502	
Total	2,192	
Telex		
Installed capacity	16,099	
Subscribers	12,165	
Free services	988	
Telephone call rates (in thousands)	1976	1980
Local	7,649	11,545
International	1,602	3,762
Investment (1980) (in thousands of U.S. dollars)		
Central office equipmnt	$ 75,650	
Local network installation	36,769	
Trunk network installations	11,568	
Installations for connections	21,306	
Technical equipment	4,295	
Total	$149,588	
Income (1980) (in thousands of U.S. dollars)		
Local telephony, automatic trunk, and international telephony	$432,292	
Manual trunk and international telephony	28,838	
Telegraph and telex communications	37,990	
Coastal radiotelephony	6,077	
Total	$505,197	

Source: Statistical Yearbook, Hellenic Telecommunications Organisation, 1980.

be followed by one at Patras in Western Greece and Heraklion in Crete.

Police.—The police force is the most important end-user of mobile radio equipment in Greece and is a major buyer of other telecommunicatons equipment as well. A major need is replacement of existing equipment. Motorola is the major supplier, but Japanese manufacturers are also gaining importance due to lower price and satisfactory quality. Data communications and facsimile equipment is under consideration to heighten efficiency and lower cost.

Transportation.—The Greek Civil Air Authority is a significant user of telecommunications equipment, with constant need for mobile radio (personal and vehicular) and VHF radios for both point-to-point and air-to-ground communication. The Authority is also considering installation of electronic telephone equipment in its premises.

The Hellenic Railways Organization employed approximately 12,500 in 1979 when it carried 4 million tons of freight and 10 million passengers. It uses two telephone systems: one is linked to the OTE, the other is completely independent. It also has its own telex network in addition to that provided by OTE. A project is under study for installation of an electronic switching system for the private network connecting railway stations and other points, permitting direct communication with personnel working on the lines and at the numerous level crossings. Also under consideration is installation of data communications equipment as part of the modernization program currently in progress and scheduled for completion in 1985.

Other end-users.—In 1979, Greece had 702 hospitals with 60,073 beds. Civilian hospitals employed 11,580 doctors, 1,736 midwives, and 16,600 nurses. Hospitals are major users of paging systems, but also have other telecommunications systems.

Six universities and seven higher educational institutions operate in Greece with limited use of communications equipment and data modems. The situation is expected to remain stable in the near term.

Most supermarkets are currently installing small PBX's and paging systems. Retail and wholesale outlets began using data terminals in 1978. Rapid expansion is expected in this sector in the near future.

Banking and insurance companies are the primary users of data communications equipment, especially data modems. Among them, they accounted for 391 data modems in 1980 (about half the total market that year). Most banks are currently installing—or will shortly—data communications equipment.

In 1980, the Banking and Stock Exchange sector had about 49 percent of installed data terminals;

Greece: Basic Economic Indicators

Population:	9.7 million (1982)
Area:	132,608 sq. km.
Administrative units:	52 Departments (nomoi)
GNP:	$37.7 billion (1981)
Contributions to GDP:	Services 51% (1981) Industry 30% Agriculture 17%
Per capita income:	$3,875 (1981)
Inflation rate:	24.5% (1981)
Exports f.o.b.:	$4,772 million (1981)
U.S. share:	8.7% (1981)
Imports c.i.f.:	$11,468 million (1981)
U.S. share:	5.5% (1981)

Major trading partners:	West Germany, Italy, France, Saudi Arabia, Egypt, Netherlands, United States, United Kingdom
Exchange rate:	84 drachmas=US$1 (1982)
Fiscal year:	Calendar year
Current account balance:	—$2,408 million (1981)
International reserves:	$1,189 million (1981)
Federal budget	
revenues:	$10.3 billion (1983)
expenditures:	$13.8 billion (1983)
Labor force:	3.2 million (1981)
Unemployment:	2.7% (1981)
Average hourly wage:	$3.06 (1981)

air transport accounted for 26 percent; 8 percent were installed in service bureaus; and 5 percent in the industrial sector. The remaining 12 percent were installed in educational and research institutions, insurance companies, public administration officers, and various others.

In 1978, Greece had about 130,000 industrial establishments employing around 700,000 persons. Only 700 of the concerns were large enough to consider buying communications equipment. They are purchasing PBX's and paging systems. Data modems should gain increased importance as well during the next 5 years.

Marketing Practices

Sales channels. — Sales of telecommunications equipment in Greece are carried out either by tender to the OTE and other large state-controlled organizations or via retail outlets to private end-users and the individual consumer. Practically all major foreign manufacturers are present—some through their own branch offices and others through agents. The main task of each is the establishment and maintenance of good contact with end-users.

OTE and other organizations deal with small and medium-sized contracts through suppliers' local offices. However, large contract negotiations are carried out directly with the manufacturer's representatives from the head office. Companies with regional headquarters can make use of their offices in Athens to offer technical assistance to the local agent and prepare the tender, but cannot participate in the tenders themselves.

A supplier anticipating offering a tender must become pre-qualified. A presentation must be made including commercial and technical data, description of its equipment, and a list of previous installations. The firm then automatically receives informaton on every new project and, if bidding is open, an invitation to tender. Local manufacturers and local agents of foreign companies must be members of the Greek Chamber of Commerce.

When tenders are called, every organization or authority provides a supplement, setting out general conditions for submissions and qualification of tenders. All vendors are presumed equal, but (as is generally the case) special connections and personal relations often prove decisive.

Credit and terms are of primary importance. All EEC nations offer credit facilities at good terms to Greek organizations, giving them preference. Many suppliers and most end-users would welcome the introduction of similar credit by the U.S. Government through EXIM bank. A successful bidder is required to deposit a good-performance guarantee of 10 percent of the value of any project totaling up to $350,000 and 5 percent of any sum exceeding that amount.

Specialized retail outlets—usually selling other electric and electronic equipment—are used for sales to many end-users. Subscribers are usually free to choose the type of equipment they want. The State Organization will install the telephone and telex equipment itself, but end-users are free to replace it as well as obligated to purchase other specialized equipment.

Aftersales service assumes priority in the decision to buy, followed by price, delivery, and lead time (among items of similar quality) in the public sector. Price is dominant in the decisionmaking process of the private sector, followed by aftersales service, quality, and delivery lead time. Other factors might include the country of origin of the equipment (specifically the political and financial arrangements with the country), credit facilities provided by the supplier, and special relations between agents and decisionmakers.

Advertising is significant only for subscriber equipment. Wide use s made of ads and announcements in the Golden Pages of the OTE in which all local manufacturers and foreign companies or their Greek agents are listed both alphabetically and by product category. Advertising material for other categories is usually through international publications.

Direct sales visits are critical and welcomed by various end-users. Most suppliers offer demonstrations of their equipment and scrupulously invite all potential end-users to these demonstrations. Officials of the OTE, Ministry of Communications, and other authorities visit major international fairs on communications equipment as well as the trio held annually in Greece: the International Fair in Salonica (usually in September), the Posidonia Fair in Piraeus specializing in marine communications and equipment (toward md-November), and the Zappelion Fair in Athens (around mid-June). Some suppliers regularly undertake mailing campaigns; however, many end-users would seem more disposed to U.S. manufacturers if the contact were direct and more frequent.

Technical standards.—The OTE requires that all imported equipment conform to CCITT and CCIR standards. The Hellenic Railways Organization requires both CCITT and CEPT standards. The Greek Police require conformity with CCITT, EIA and CCIR standards. Electricity distributed in Greece is 220V single-phase, 380V three-phase, at a frequency of 50Hz.

Trade Restrictions

Although trade is free in Greece and imports are permitted from all countries, a great many financial and other controls do exist. Equipment originating from EEC nations is free of import duty. However, upon arrival, a business activity tax as well as contribution to the Agricultural Insurance Organization is mandated at rates determined by product classification.

Equipment from the United States and other non-EEC countries is subject to the above plus import duty. No telecommunication equipment is subject to any import quota or other restriction.

Useful Addresses

Embassies

American Embassy
Commercial Section
91 Vasilissis Sophias Blvd.
Athens
tf: 721-2951
tx: 21-5548

Embassy of Greece
2221 Massachusetts Avenue, N.W.
Washington, DC 20008
tf: 667-3168

Telecommunications administration

Ministry of Communications
General Director of Posts and Telecommunications
49 Syngrou Avenue
Athens
Attn: Director General
tf: 923 2930
tx: gentel athinai

PTT

Hellenic Telecommunications Organization, S.A. (OTE)
15, Stadiou Street
Athens 124
Attn: Gouverneur de l'OTE
tf: 882-8333
tg: ote athinai
tx: 219797 ote gr

Leased lines and data communications

Hellenic Telecommunications Authority
Special Communications Division
5 Stadiou Street
Athens
tf: 322-6399
tx: 215482

Radio/television broadcasting

Elliniki Radiophonia Tileorassi (ERT)
(Hellenic Radio Television)
P.O. Box 19
Aghia Paraskevi, Attikis
Athens
Attn: Director General
tf: 65-95-970
tg: radiostathens athinai
tx: 216066 ert gr

Technical standards

Greek Ministry of Commerce
Directorate of International Organizations and Conventions
Ministry of Commerce Building
Canningos Square
Athens
tf: 3602295
tx: 219033 ypem gr

Additional Information

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
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U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-2988

The Survey summarizes a 158-page research report prepared by the Middle East Marketing Research Bureau under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Departments of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey as well as the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "Markt Research Survey on Communications Equipment in Greece," ITA 82-08-504, June 1982.

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Saudi Arabia

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Country Market Survey

Agricultural Machinery and Equipment

Saudi Arabia

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

After investing heavily in the traditional farming sector during the 1970's, the Saudi Arabian Government is turning its attention to modern agricultural activities. The nation's Third Five—Year Plan will provide $2.25 billion[1] in loans and subsidies to private agricultural investors over the 1980-85 period. These investments and other Government incentives to augment agricultural output are clearly intended to foster larger farming units and agri-business enterprises. During the next few years, these measures are expected to bring a substantial increase in the extent and scale of commercial farming. The accompanying upsurge in demand for agricultural machinery and equipment is expected to boost sales more than 80 percent in 1980-87, as annual purchases climb to almost $395 million by the end of the period (see table 1).

U.S. sources supplied 30 percent of the Saudi market[2] for agricultural machinery and equipment in 1980 (see table 2). Over the next few years, increases in farm size and in agri-business activity should augment demand for large-scale and heavy duty equipment and broaden potential markets for U.S. products, particularly in the tractor, harvester, and irrigation lines (see Best Sales Opportunities for U.S. Exporters box).

In Saudi Arabia's remarkable economic expansion, real per capita income has more than doubled since 1970, rising to an estimated $15,000 in 1981. As living standards have improved, the local population has consumed increasing quantities of fresh fruits and vegetables, poultry products, and meats. Food imports have risen substantially, prompting Government authorities to include self-sufficiency in food production among the primary goals of the Third Plan. During the early 1980's, priorities are expansion of wheat and vegetable cultivation and increases in output for dairy, meat, and poultry products. To attract investors to these activities, the Government is providing free land, interest-free loans, and subsidies for machinery and equipment purchases. Moreover, for many crops, the Government provides price guarantees that are well above world market levels. Preliminary data indicate performance may well exceed the Plan's targeted annual increases of 5 percent for agricultural output and 8 percent for productivity.

Strong growth is anticipated in the Kingdom's two largest market segments, tractors and irrigation and spraying equipment. Together they accounted for over 80 percent of 1980 farm machinery sales. Tractor sales were valued at $82 million in 1980, an increase of more than 50 percent from 1979. Purchases are forecast to continue rising at about 10 percent a year, bringing the tractor market to nearly $160 million in 1987. Particular demand is anticipated for units over 250 horsepower (hp) as well as for small, under 25 hp, tractors.

The Saudi market for irrigation equipment is one of the largest in the world. Expansion of irrigated land to support increased food production is a major objective of the Third Plan. And since water is a precious resource in the Kingdom, demand is strong for the most modern and efficient equipment. Excellent sales prospects are foreseen for hydraulic pumps, irrigation systems, and spraying equipment, providing a $157.5 million market in 1987. Considerable demand is anticipated for vertical turbine pumps; centrifugal units are purchased mainly for shallow wells or for use as booster pumps in sprinkling systems. The most popular irrigation systems are center pivot, used primarily by large wheat and alfalfa growers, and traveling guns, favored by smaller farmers. Annual sales of 1,800 to 2,000 units are projected for pivot systems over the next few years. Trade sources indicate demand is also developing for equipment to dose or inject fertilizers through irrigation systems.

Sales increases averaging 10 percent a year through 1987 are forecast for poultry equipment and harvesting machinery. In spite of sharp rises in both poultry and egg production in recent years, this sector has not been able to keep up with increases in consumption. Investments in new and expanded facilities are expected to boost purchases of poultry equipment to around $32 million in 1987. Expansion of grain and fodder crops should cause purchases of harvesting and related equipment to top $16 million in 1987. Annual increases averaging about 8 percent are projected for sales of soil cultivation equipment and dairy equipment, bringing these market segments to $17.5 million and $11.5 million, respectively, in 1987.

Table 1.—Saudi Arabia: Market for agricultural machinery and agri-related equipment 1978-80 and projected 1987

(in millions of U.S. dollars)

	1978	1979	1980	1987
Tractors	47.67	52.10	81.98	159.8
Soil cultivation, planting, and fertilizing equipment	5.02	8.32	10.20	17.5
Harvesting, threshing, and mowing machinery	3.02	4.40	8.52	16.6
Irrigation and spraying equipment	39.08	67.73	91.90	157.5
Poultry equipment	7.93	7.24	16.26	31.7
Dairy equipment	1.71	9.74	6.72	11.5
Total market	104.43	149.53	215.58	394.6

Source: International Trade Administration, Office of Trade Information Services research report, Saudi Arabian trade statistics, and trade source estimates.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1 = 3.40 riyals (1978), 3.36 riyals (1979), and 3.33 riyals (1980 and subsequent years). Values through 1980 are expressed in current rather than constant dollars; values for 1981 and subsequent years are expressed in 1980 constant dollars.

[2] The Saudi Arabian market is supplied entirely by imports (c.i.f.). Parts are excluded.

Saudi Arabia.—Best sales opportunities for U.S. exporters

- **Wheel Tractors**
  - Over 80 hp
  - Over 150 hp
- **Implements and attachments**
  - for tractors over 120 hp
- **Harvesting equipment**
  - Combines, self-propelled
  - Field forage harvesters
  - Windrowers and swathers
  - Aeration and drying equipment
- **Foraging, Silage, and Mowing Equipment**
  - Silage choppers; forage and grain harvesters
  - Loaders/unloaders; handling equipment
- **Plowing and cultivating equipment**
  - for tractors over 150 hp
  - Moldboard plows
  - Disc plows
  - Chisel plows
  - Cultivators, tractor drawn
  - Harrows
  - Tractor disc
  - Roller
  - Toothed
  - Soil pulverizers
  - Tillers
  - Disc
  - Rotary
  - Subsoilers
  - Rod weeders
- **Spraying and dusting equipment**
  - Pesticide sprayers, power operated
  - Pesticide dusters, power operated
- **Irrigation equipment**
  - Self-propelled
  - Center-pivot
  - High-pressure overhead (tower, boom)
- **Grain and seed specialty equipment**
  - Grain and seed handling and storing equipment
- **Poultry equipment**
  - Incubators and brooders
  - Feeding and watering units, mechanical
  - Egg washers, sorters, graders, handlers
- **Dairy farm equipment**
  - Milking machines, mechanical
  - Pipeline milking units
  - Barnyard equipment
  - Feed grinders/mixers
  - Manure handlers
- **Water well drilling equipment**
  - Portable and blast hole drills
  - Rotary drills

Source: Saudi Arabian trade source estimates.

Table 2.—Saudi Arabia: Imports of agricultural machinery and agri-related equipment by country of origin 1979-80, and projected 1987

(in millions of U.S. dollars)

	1979		1980		1987	
	Value ($)	Share (%)	Value ($)	Share (%)	Value ($)	Share (%)
United States	40.13	26.8	64.23	29.8	112.0	28
United Kingdom	34.74	23.2	34.69	16.1	60.7	15
Germany	10.59	7.1	26.40	12.3	50.4	13
France	17.08	11.4	19.58	9.1	30.5	8
Sweden	15.69	10.5	19.00	8.8	39.4	10
Italy	8.06	5.4	9.93	4.6	17.9	5
Austria	3.30	2.2	9.49	4.4	12.	3
Japan	3.70	2.5	7.38	3.4	14.1	4
Denmark	4.62	3.1	5.86	2.7	10.2	3
Spain	.49	.3	3.15	1.5	4.2	1
Netherlands	1.83	1.2	2.67	1.2	4.8	1
Belgium	37	.3	1.64	.8	3.3	1
Switzerland	.84	.6	1.57	.7	2.7	–
Others	8.09	5.4	9.99	4.6	31.6	8
Total imports	149.53	100.0	215.58	100.0	394.6	100

Source: International Trade Administration, Office of Trade Information Services research report, Saudi Arabian trade statistics, and trade source estimates.

Competitive Environment

Virtually all agricultural machinery and equipment sold in Saudi Arabia is imported. Domestic manufacture is limited to simple implements and fencing and does not constitute an appreciable portion of sales. Although local production is likely to increase in the early 1980's, the Saudi market's reliance on imported farm equipment is not expected to diminish by 1987.

U.S. Suppliers.—American manufacturers are the leading foreign suppliers, registering sales of $64 million in 1980. Although competition is intensifying throughout this market, U.S. companies are expected to improve their market position for several types of equipment and to hold a 28 percent import share through 1987, when U.S. shipments are projected at $112 million.

Irrigation equipment accounts for about 70 percent of direct U.S. sales. Saudi end-users consider American systems to be the best available on the world market; of the $10 million worth of irrigation and spraying equipment imported in 1980, U.S. suppliers held 66 percent. American brands dominate sales of center pivot systems, currently considered most suitable for Saudi conditions. Valmont Industries is firmly established with its Valley systems. Pierce is also highly successful; the firm currently has the capacity to install four to five pivot systems per week in the Kingdom. Other major suppliers of irrigation systems are Lindsay, Lockwood, and Reinke. Most sales of system components and accessories also go to American firms. Gorman-Rupp, Johnson, and United States Motors were among the U.S. manufacturers who supplied close to half of the agricultural market for hydraulic pumps in 1980, with sales totaling $38.3 million. Other component suppliers include Randolph (gear heads), Dally (valves), Watson McDaniel (drive shafts), and Caterpillar (engines and generating sets). In spraying and dusting lines, trade sources anticipate opportunities for increasing U.S. sales of greenhouse units and tractor-drawn or tractor-mounted equipment.

Selling chiefly large tractors, U.S. manufacturers accounted for 14 percent of the tractor market in 1980 and are forecast to expand their share to about 17 percent in 1987, when direct shipments from U.S. factories are expected to reach nearly $27 million. John Deere and Steiger Tractor are the sales leaders for over 250 hp units and compete very effectively in the 150-250 hp range as well. International Harvester and Caterpillar tractors are also widely used in Saudi agriculture. Large, four-wheel-drive units should account for most of the increase anticipated in U.S. tractor sales. Sourcing for implements closely follows the pattern for tractors; consequently, enhanced sales prospects are also foreseen for U.S. suppliers of heavy duty implements for hydraulically operated tractors.

About 20 percent of the market for harvesting and related equipment has been captured by U.S. manufacturers, whose sales are projected at $3.3 million in 1987. Self-propelled combines are the major item in these sales, and Sperry New Holland is among the most popular suppliers. Expansion of fodder crops during the next few years should give U.S. suppliers broader markets for forage harvesters, haymaking equipment, and other mowing and silage equipment.

U.S. lines of poultry equipment have done very well in the Saudi market and are expected to bring $6.7 million in sales in 1987. Since the Government is strongly supporting expansion of poultry and egg output, considerable potential exists for increasing U.S. sales of incubators, brooders, feeders and waterers as well as egg washers and sorters. Turnkey installations, supplied primarily by Big Dutchman (U.S.), are important in the poultry equipment market.

The principal suppliers of dairy equipment are U.S. and Danish sources, each providing about 30 percent of the $6.7 million in imports in 1980. The market position of Danish suppliers and several other European manufacturers as well derives from their participation in the early development of the Saudi dairy industry. However, continued expansion of dairy output should provide U.S. suppliers with opportunities to increase their sales of milking machines, pipeline milking units, barnyard equipment, and other types of dairy equipment.

Third-country suppliers.—British manufacturers shipped $34.7 million worth of agricultural machinery and equipment to Saudi Arabia in 1980, providing 16 percent of imports. They supplied about 30 percent of the Saudi tractor market in 1980 with sales of $23.8 million. Massey-Ferguson, supplying the Saudi market primarily from its U.K. subsidiary, was an early market entrant and is presently a sales leader for 80-150 hp tractors. The firm is a strong competitor and enjoys an established reputation in farming circles. David Brown and Leyland also sell tractors in Saudi Arabia. British firms are active in most other segments of this market as well, achieving notable sales in 1980 of hydraulic pumps ($6.5 million) and culitivation equipment ($2.3 million).

A 12 percent import share was held by German manufacturers in 1980, with sales of $26.4 million. Tractors represent over half of German sales; the two principal suppliers, Deutz and Fendt, are important competitors in the over 200 hp range. In 1980 German firms were the leading suppliers of poultry and egg equipment (sales of $5.3 million, 34 percent of imports). Lohmann and Kathmann are active in the market for turnkey poultry installations. German-made harvesting machinery, particularly from Claas, garnered a 24 percent share in 1980 with sales of $2 million.

Swedish and French sources each held about 9 percent of imports in 1980. Tractors, most of which are supplied by Volvo, make up around 85 percent of Swedish sales. Volvo is forecast to capture more than 20 percent of the tractor market by 1987; farmers who already pump water with Volvo diesel engines expect to simplify maintenance and repair by using equipment from the same manufacturer. In addition, Volvo's attention to local representation and after-sales service have contributed to the company's success in the Saudi market. Swedish firms (chiefly Alfa-Laval) are also important competitors in dairy machinery lines, supplying about 20 percent of these imports in 1980. Hydraulic pumps account for the bulk of French sales.

There are also a number of important competitors from other European countries and Japan. Active in the tractor market are suppliers from Austria (Steyr), Spain (Ebro), and Italy (Fiat). Imports from Japan, valued at a total of $7.4 million in 1980, consist mainly of equipment used in greenhouses; light tractors (under 25 hp) supplied by Kubota and small sprayers account for most sales. Laverda is an established supplier of harvesting equipment. Danish sources compete effectively with rotary mowers and silage choppers as well as dairy equipment lines.

Domestic suppliers.—Forecasts through 1987 do not anticipate that domestic production will supply a significant portion of the Saudi market. But over a longer term more types of agricultural machinery and equipment are expected to be assembled or manufactured locally under licensing agreements with foreign firms. At present, simple agricultural implements are produced on a small scale by blacksmiths and workshops in the farming areas of Al Kharj and Al Gasim; output includes ridgers, furrowers, and tractor-mounted land leveling devices. Water pumps are assembled by workshops in Mecca and Riyadh.

Plans are in various stages of realization for related types of domestic production. A chain link fencing plant is under construction in Al Ghatt; it should begin production in 1983, with monthly output during the first year projected at 30,000 linear meters. The Saudi Government has granted the Agricultural Development Company of Tabuk a local license to produce irrigation equipment and greenhouses. This firm, with eventual full capitalization of $8.3 million, expects to employ 37 workers. Other projects are pending conclusion of foreign licensing agreements. The Al Baala firm in Riyadh has secured authorization from the Saudi Government to produce pivot irrigation systems and is reportedly seeking a license from a U.S. firm.

Major Purchasers

Pouring huge amounts of public funds into farming projects, the Saudi Government is an important influence in the Kingdom's agricultural sector. Principal Government agencies concerned with agricultural development are the Ministry of Agriculture and water Resources and the Saudi Arabian Agricultural Bank (SAAB). Expenditures for agricultural projects in the Third Plan total $8.1 billion, including allocations of $5.6 billion to the Ministry of Agriculture and $2.5 billion to be disbursed by SAAB. Another $10.5 billion has been appropriated for the Saline Water Conversion Corporation, an independent agency.

The Ministry of Agriculture has several programs dedicated to expanding and improving farm output; the most important of these involve vegetable crops, poultry and eggs, milk products, and bee keeping. Crop and livestock production, locust control, sand stabilization, and land classification programs will be emphasized during the Third Plan. The laboratories maintained by the Ministry produce animal vaccines and monitor animal diseases. Services to farmers include plant protection, locust control, and mobile veterinary units. In addition, about a dozen research stations and experimental farms are operated by the Ministry.

SAAB, founded in 1974 and headquartered in Riyadh, is the main vehicle for financing agricultural development; its nationwide network of branches is to be expanded to 70 offices during 1980-85. The Bank provides farmers with short-term loans for fertilizer, seed, and other supplies, and grants medium- and long-term loans for equipment purchases and infrastructure projects. SAAB distributed over $340 million in loans during 1980, with farmers in the highly productive central region receiving over 60 percent of these funds (see table 3). Loans in 1980 included $132 million to finance machinery and equipment purchases plus $43 million for purchases of irrigation pumps and engines. Subsidies handled by the Bank in 1980 provided $37 million for agricultural equipment, $49 million for pumps

Table 3.—Saudi Arabia: Medium-term loans and subsidies to the agricultural sector, by objective, 1978 and 1980

(in millions of U.S. dollars)

	1978		1980	
	Loans	Subsidies	Loans	Subsidies
Pumps and engines	25.6	29.9	42.8	49.2
Machinery and equipment				
Agricultural machinery	29.4	13.3	67.0	34.6
Poultry and dairy farm equipment	31.8	1.4	13.7	2.6
Greenhouses	–	–	19.4	–
Other machinery	13.5	–	31.5	–
Animals				
Projects for raising and breeding poultry and animals	6.1	–	64.0	–
Feeds	3.8	24.0	–	37.8
Infrastructure	42.2	–	92.3	–
Other projects	7.0	2.4	11.7	6.7
Total	159.4	71.0	342.4	130.9

Source: Saudi Arabian trade source estimates.

and engines, and $38 million for animal and poultry feeds. In the Third Plan, SAAB has been allocated $1.5 billion for loans and $150 million for subsidy programs.

Saudi Arabia's arable land resources, estimated by the Ministry of Agriculture at approximately 4.5 million hectares (ha)[3], include 650,000 ha under cultivation, another 450,000 ha regarded as suitable for cultivation, and 3.4 million ha (75 percent of the total) that have not been classified. During the term of the Second Development Plan, the Government distributed 99,000 ha of land; another 80,000 ha are slated for distribution under the Third Plan.

Government sources concede that the allocation of land in small parcels averaging less than 10 ha during the first two Five Year Plans failed to boost output substantially. Although the current law governing land allocation continues to impose serious limitations on farm size, the Government is using other measures to step up more economical, large-scale production. Moreover, the allocation policy itself is said to be under review and likely to be revised to permit distribution of larger tracts of land.

For planning purposes, the country is divided into five agricultural regions: central, eastern, western, northern, and southwestern. Well over half the area under cultivation is in the southwestern region; at present, the other important agricultural areas are the central region, with 16 percent of cultivated land, and the western region, with 23 percent. Economically, the central region is the most important; it accounts for well over half the production of all major crops except sorghum which is grown chiefly in the southwestern and western regions (see table 4). Nearly 600,000 persons, about one quarter of the Kingdom's labor force, work in agriculture.

The traditional agricultural sector includes Bedouins and settled farmers, most of whom operate in the southwestern region. Livestock raising has been the main activity of the Bedouin population for hundreds of years. Today, although some Bedouins cultivate land and farm dates, much of this population still relies on sheep, goat, and camel raising for its livelihood. Most of the 180,000 settled farmers raise sorghum and dates on holdings that average less than 4 ha. The agricultural projects in the first two Development Plans focused on improving living standards throughout the traditional sector and on settlement projects for the Bedouin population. Several new vegetable crops were introduced in the 1970's, and some increases were achieved in fruit production. Labor shortages, however, have become a problem for some crops, particularly affecting date harvests in recent years. The traditional sector remains heavily dependent on sorghum, and given the small size of land holdings, potential for mechanization is limited. Irrigation is just coming into use, and farmers in this sector have yet to become important users of agricultural machinery or equipment.

The modern sector is of recent origin, dating for the most part from the late 1970's and early 1980's. Although poultry and egg producers were fairly well established during the 1970's, modern forms of cereal and vegetable farming, livestock raising, and dairying were only introduced toward the end of the decade. Most agri-business enterprises have been established since 1980.

During the next few years, much of the growth in modern farming will be in areas identified in hydro-agricultural surveys as having potential for extensive cultivation; these include Qassim, Al Kuhayfiyah, Wadi Al Dawasir, Al Kharj, and Aflaj. Surveys have identified 40,000 ha of potentially arable land in Qassim, already one of the most important agricultural districts in the country, and 14,500 ha in nearby Al Kuhayfiyah; both areas are regarded as suitable for large-scale cereal production. The main source of water for these two areas is the Sag aquifer; wells more than 400 meters deep yield good quality water in Qassim, but greater depths are generally required in Al Kuhayfiyah. In Wadi Al Dawasir, 40,000 ha are under cultivation and another 600,000 ha are considered arable. Most of this area has desert conditions and no precipitation. Temperatures can reach 113-118 degrees F; windbreaks are needed in most land reclamation projects to protect crops from strong winds five months of the year. Good quality water is available in Wadi Al Dawasir from wells 150-250 meters deep. Together the plains of Al Kharj and Aflaj are estimated to have a total of 25,000 ha of land suitable for large-scale cereal production; adequate water supplies are found less than 100 meters below the surface in Al Kharj.

Wheat is the primary cereal crop in the modern sector. Production totaled 158,000 tons in the 1979-80 crop year, more than double output in 1970. Rapid expansion in wheat farming is augmenting demand for water well drilling, irrigation, seeding, and harvesting equipment and is expected to make Saudi Arabia self-sufficient in wheat by 1985-87. As more forage crops and livestock are introduced into the wheat rotation cycle, mixed farming activities are expected to take on increasing importance in the modern sector.

Table 4.—Saudi Arabia: Production of agricultural products, by region, 1978

(in thousands of tons)

	Wheat	Sorghum	Tomatoes	Onions	Watermelons	Dates
Region						
Eastern	.4	–	27.7	6.7	.6	113.0
Central	62.2	6.6	85.7	84.7	110.2	159.1
Northern	3.1	–	4.0	1.9	3.2	34.5
Western	8.9	44.4	31.1	.5	18.6	76.9
Southwestern	45.4	102.0	18.5	1.2	7.4	27.5
Total	120.0	153.0	167.0	95.0	140.0	411.0

Source: Saudi Arabian trade source estimates

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[3] One hectare = 2.47 acres.

Most of the wheat crop is produced on privately owned farms averaging between 20 and 50 ha, medium-scale by Saudi standards. Owners of these farms are presently the largest end-users for agricultural equipment; they usually rely on agricultural machinery for cultivation and are receptive to programs introducing new types of seeds, fertilizers, and crop protection methods. Most medium-size wheat farms have their own water pumps and employ 60-80 hp tractors with appropriate attachments and accessories. These farmers generally have good access to credit, and many borrow from SAAB for equipment purchases.

The operators of large wheat farms are the principal buyers of large-scale equipment in harvesting and specialized lines. Trade sources expect 2,000 to 3,000 farms will be operated on an agri-business basis by 1987; many of these will be over 200 ha in size and produce a combination of wheat and alfalfa, Rhodes or Sudan grass, and livestock. One of the first agri-businesses formed was the Haradh Agriculture and Animal Production Company (HAAPCO), originally Government-owned but later opened to private investors. HAAPCO has a 4,000 hectare farm in the Haradh oasis, near the Rub al-Khali desert, and has been allocated 20,000 ha of land at Wadi Al Dawasir where another major farm is being developed. Nadco, a spin-off from HAAPCO designed to stimulate agricultural development nationwide, was organized in a similar manner; its projects are managed by FMC Saudi Arabia, a joint venture involving FMC of the United States and the Olayan group of companies based in Al-Khobar. Private investors provided 80 percent of Nadco's $117.6 million initial equity.

Most vegetable farmers in the modern sector rely on greenhouse cultivation for the bulk of their crops. A number of vegetable greenhouses were established in the late 1970's in the Riyadh and Bureidah areas as well as in Hofouf for markets in Dammam and Al Khobar and near Taif to serve Jeddah and Mecca. SAAB began financing greenhouse investments in 1979, approving 11 projects that year for a total of almost $20 million. Hydroponically grown tomatoes and cucumbers are the principal crops. Several locally popular vegetables, including eggplant, okra, and green beans, are also cultivated in this manner, as are potato and onion crops. Fiberglass greenhouse construction with evaporative cooling allows two to three crops a year. Because of the excessively hot weather, only one crop can be grown during the summer months without cooling in most areas. Excellent sales prospects are foreseen for greenhouse equipment and installations. Many growers prefer turnkey projects that include greenhouse design and equipment as well as technical and managerial assistance. A number of Dutch and German companies reportedly offer these services.

A promising future is foreseen for cattle and sheep raising in Saudi Arabia. Trade sources anticipate at least 100 new livestock farms will be established by 1987, about 15 percent of which are expected to engage in dairying. The nation's dairy herd consisted of about 7,000 cows in 1980. Since climatic conditions do not favor the establishment of pastures, extensive livestock breeding is not practicable in Saudi Arabia, and most of the new producers will utilize intensive breeding techniques in a controlled environment. To encourage dairy production, the Saudi Government underwrites the full cost of air transport for breeding cows from the United States or Europe and provides subsidies to dairy farmers for purchases of several types of equipment, including automatic milking machines, containers for storing, refrigerating, and transporting milk, refrigerated vehicles, milk processing and weighing equipment, and laboratory equipment for quality control. During 1981 and the first few months of 1982, SAAB approved 14 livestock projects that involved an aggregate investment of $35 million and had another 17 projects under study.

The Saudi Arabian Agricultural and Dairy Company (SAADCO), one of the new modern dairy enterprises, began operations in 1981 on 60 square kilometers of land in Al Khar, near Riyadh. SAADCO is a fully integrated organization, raising its own cows and much of its feed and processing and marketing milk under the SAADCO brand name. Current daily production is approximately 45,000 liters of homogenized milk and laban (liquid yogurt). SAADCO plans to have 25,000 dairy cows by 1985. Since it has ample water resources, SAADCO has invested nearly $3 million in hydroponic units to produce the herd's forage feed. SAADCO is managed by Alfa-Laval of Sweden which has provided most of the dairy equipment used at Al Khar.

Up to the late 1970's all meat was imported except that provided by locally bred Najdi sheep, regarded as a delicacy in Saudi Arabia and priced accordingly. Meat from freshly slaughtered sheep is preferred; consequently, many animals are imported live. Some of the country's major livestock importers plan to establish fattening units so that smaller animals can be shipped less expensively from abroad. Sheikh Mahmoud Nasser, one of the largest importers, has already announced plans to establish fattening lots capable of handling 100,000 sheep and 30,000 cattle each year. In the Al Qassim area, a number of importers envision new facilities for fattening a total of 800,000 sheep a year.

In the booming poultry industry, broiler production rose 24 percent a year, from 10 million to nearly 30 million during 1974-79, but was outpaced by a surge in consumption, which increased more than 40 percent annually. As a result, locally produced poultry, which supplied 35 percent of the Saudi market in 1974, only accounted for 16 percent of consumption in 1979. Domestic egg output has more closely approximated consumption in recent years and should approach self-sufficiency by 1985, when production reaches 920 million eggs.

Government policy is to encourage broiler and egg output in every possible manner, and the number of new enterprises in these activities is reportedly rising rapidly. Through loan and subsidy programs administered by SAAB, the Government is inducing the formation of larger scale undertakings, particularly vertically integrated poultry farms which have their own hatcheries and feed mills as well as slaughtering and freezing lines. Greater use of air conditioning systems is being promoted to eliminate seasonal fluctuations in production and as a means of lowering chicken mortality rates. At present most chicken farms have open-air compartments and must operate considerably below capacity in summer months. To assist small farmers, the Ministry of Agriculture is going to provide slaughtering, packaging, storage, and marketing facilities on a regional basis through the newly formed National Poultry Association.

SAAB lends poultry growers 80 percent of their capital requirements up to approximately $1 million, and 60 percent for larger loans. These loans are for five years and are free of interest. During the first quarter of 1982, the Bank approved five projects for broiler producers involving an aggregate investment of over $20 million (capacity for 9 million broilers a year) and had another 60 projects under consideration. In the same quarter, SAAB approved projects valued at $19 million for egg producers, adding a projected 132 million eggs to annual output.

Poultry farmers who raise at least 2,000 birds and meet other standards set by the Ministry of Agriculture and local authorities are eligible for SAAB subsidies when purchasing automatic poultry feeders; incubators and brooders; feed mixers; slaughtering, refrigerating, and freezing equipment; egg gathering, grading, and cleaning trays; chick crates and cartons; feed bags; and such auxiliary equipment as electric generators. SAAB also subsidizes half the cost of poultry feed when the protein content is at least 36 percent.

Most Saudi chicken farms are small, having four to six compartments, each with a capacity of 5,000 chickens. However, there are a number of modern, fully mechanized facilities as well, including those of the Faqeeh farm in Taif and the Yamama farms in Al Kharj. Faqeeh is by far the largest chicken and egg producer in Saudi Arabia, operating its own hatcheries, fodder factory, and totally separate egg and chicken units. This farm has more than 200 compartments, including 16 air-conditioned units that are used mainly for hatching and for table eggs. The staff consists of 200 employees, including five veterinarians. Faqeeh chickens are sold at 52 days, but many other producers sell theirs at 42 to 46 days. The Al Qassim Farm in Kharj is a typical egg producer; four compartments are used for breeding and another 12 are dedicated to egg production, housing 3,000 hens in each. These compartments are not air-conditioned, however, and can be operated at only about 65 percent of capacity during the summer months.

Market Access Data

Most of the agricultural machinery and equipment sold in the Saudi market is handled by importing and distributing companies that act as sole agents for a number of manufacturers. Many of these firms have separate divisions for handling agricultural machinery and supplies. There are also a number of distributors who specialize in agricultural lines. These firms generally stock spare parts and provide after-sales service. Large agents and distributors usually maintain offices in Jeddah, Riyadh, and Dammam Al-Khobar as well as in the agricultural centers of Abha, Jizzan, Bureidah, and Hofouf.

Brand name recognition and quality local representation are often of more importance to Saudi farmers than price factors in purchase decisions for agricultural equipment. The availability of interest-free loans and subsidies for equipment purchases tends to diminish the importance of competitive prices in this market. In selecting equipment, most buyers give considerable weight to the accessibility and reliability of spare parts supplies and to local dealers' reputations for after-sales service.

Sales promotion and marketing efforts are very limited for agricultural equipment. Little use is made of print advertising for these purposes, and no advertising is permitted on either radio or television in Saudi Arabia. Roadside billboards have proven useful in agricultural zones. Sales calls are regarded as effective only in the modern sector, particularly with end-users in agri-business enterprises. Field demonstrations and participation in agricultural exhibits have proven successful for promotional purposes. The Saudi Agriculture 82 exhibit was particularly successful in this regard; other important events of this type include biannual exhibits sponsored by the Faculty of Agricultural Engineers at Riyadh University and regionally oriented exhibits in Dubai, Bahrain, and Kuwait.

Trade sources frequently suggest that equipment suppliers who are interested in taking full advantage of growth prospects in the Saudi market for agricultural equipment may find it beneficial to explore joint venture agreements or management contracts with local developers. A considerable volume of business, particularly in greenhouse installations, poultry raising, and dairying, is done on a turnkey basis, and many suppliers have gained strong footholds in these fields by participating in the initial planning and management of new projects.

Imported agricultural machinery and equipment are exempt from duty. Foreign-built machinery and pumps imported for use in agriculture must be licensed by the Ministry of Agriculture which tests equipment for suitability to local conditions. The Nebraska and Common Market certifications for tractors and farm equipment are helpful in processing licenses but cannot be submitted in lieu of completing local licensing procedures.

The Ministry of Agriculture regulates the import and pricing of equipment bought with government subsidies. Subsidy rates are established as a percent of the equipment's value (c.i.f. value plus 20 percent). Subsidies of 50 percent apply to purchases of tractors and irrigation engines and pumps; for implements, the rate is 45 percent. For poultry and dairy equipment, the subsidy rate is 20 percent when purchases are financed by SAAB loans and 30 percent for other transactions. Importers must periodically submit price lists for subsidized items to the Ministry of Agriculture for approval and cannot increase these prices without the Ministry's authorization.

Additional Information

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Country Market Survey

Electronic Components

Japan

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The electronic components market in Japan is expected to continue rising an average 13 percent annually from $10.6 billion in 1980 to more than $19 billion[1] in 1985 (see table 1). Sales of passive components represented the largest share, accounting for 60 percent of the total market in 1980, followed by semiconductors (32 percent), and electron tubes (8 percent).

The market for semiconductors exhibits the greatest potential, forecast to advance at a rate of 15 percent per year between 1980 and 1985. Close behind are passive component sales with projected increases of 12 percent each year during the same period. Electron tube sales are expected to progress at a more gradual pace of 8 percent per annum.

U.S. firms supplied nearly half the electronic components imported into Japan in 1980 (see table 2), although this penetration is predicted to slip slightly in the future. The American influence is further reinforced by manufacturing subsidiaries of U.S. companies in Japan and joint ventures with local firms.

End-Users

Output of the more than 2,000 companies in nine industrial sectors that use electronic components in their products totaled $65 billion in 1980 (see table 3); capital expenditures were pegged at $2.4 billion. A handful of very large companies such as Matsushita Electric Industrial Co., Ltd., Hitachi, Ltd., and Toshiba Corp. hold large market shares in most of these sectors.

The home entertainment products industry consumes the highest percentage of electronic components (51 percent), followed by the producers of computers and business systems, communications equipment, consumer electronics, and automotive equipment (see table 4). These five industries account for more than 90 percent of total consumption.

Home entertainment products.—The home entertainment products sector consists of 55 manufacturers whose output was valued at $11 billion in 1980. Two major companies, Matsushita Electric and Sony Corp., accounted for over half of this output. Matsushita is the largest producer of TV's in the world, selling television sets under the Panasonic, National, and Quasar brand names. Sony is the second largest producer of TV sets and the third largest producer of video tape recorders (VTR's) in Japan. Output of home entertainment products is forecast to reach $17.5 billion in 1985.

Sales of video equipment amounted to $6 billion in 1980 and should almost double by 1985, reaching $11.8 billion. Audio equipment output totaled $4.8 billion in 1980 and is expected to increase only slightly during the next few years. Electronic musical instrument sales reached $342 million in 1980 and are forecast to increase to $551 million in 1985.

Spearheading this sector's growth during the 1980-85 period will be the dramatic burgeoning of VTR output which is predicted to skyrocket 26 percent annually, soaring from a $2.5 billion level in 1980 to $7.9 billion in 1985. The use of integrated circuits (IC's) in VTR's is expected to rise as manufacturers take steps to reduce size and weight of their products and, at the same time, enhance picture quality. In addition, industry observers see solid-state image-sensing devices replacing image-sensing electron tubes in VTR cameras.

A record 12 million color TV sets were produced in 1980. Growth in this sector should be stable through 1985, with sales edging up to $3.6 billion, while production of black and white TV's should continue to decrease slowly.

Computers and business systems.—Production in the computer and business systems sector reached $7.5 billion in 1980 and is forecast to rise an average 13 percent annually to $14 billion in 1985. Sparking these growth expectations is the predicted diffusion of office automation equipment.

Major manufacturers among the 155 firms comprising this sector are Fujitsu Limited (leading producer of large-scale computers), Nippon Electric Co., Ltd. (top producer of personal computers), Richho Co., Ltd. (largest copying machine manufacturer), and Tokyo Electric Co., Ltd. (a subsidiary of Toshiba Corp., and the leading producer of electronic cash registers).

Manufacturers of computers and peripheral equipment are the pacesetters in this sector, with production totaling $5.7 billion in 1980. With a projected annual gain of 15 percent, sales should exceed $11.5 billion by 1985.

Sales of large and mid-sized computers are now limited primarily to replacement purchases. On the other hand, demand for office computers, minicomputers, and personal computers should show a steady increase. Sales of word processors are also earmarked for a gradual rise.

Production of copying machines is expected to advance 8 percent a year during the 1980-85 period, climbing from $1.4 billion in 1980 to $2 billion in 1985. Electronic cash register sales were reported at $383 million in 1980 and should post a steady 5 percent gain each year, reaching $494 million by 1985.

Communications equipment.—Production of $4.3 billion was chalked up in 1980 by the 175 companies that comprise the communications equipment sector.

Source: "International Market Research on Electronic Components—Japan", A. T. Kearney International, Inc., March 31, 1982, prepared under contract to International Trade Administration, Office of Trade Information Services (see Additional Information box).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = 210.47 Yen (1978), 219.17 Yen (1979), and 226.75 Yen (1980 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 1.—Japan: The market[1] for electronic components, 1978-82 and projected 1985
(in millions of U.S. dollars)

			Estimated		Projected	
	1978	1979	1980	1981	1982	1985
Passive components						
Production	6.50	7.02	8.15	9.62	10.8	14.9
Imports	.31	.41	.52	.58	.6	.8
Exports (less)	1.58	1.95	2.33	2.58	2.9	4.5
Total	5.23	5.48	6.34	7.62	8.5	11.2
Semiconductors						
Production	2.53	2.91	3.81	4.70	5.5	8.6
Imports	.38	.56	.61	.66	.7	.8
Exports (less)	.48	.75	1.09	1.19	1.4	2.7
Total	2.43	2.72	3.33	4.17	4.8	6.7
Electron tubes						
Production	1.32	1.26	1.49	1.84	1.9	2.2
Imports	.03	.05	.07	.07	.1	.1
Exports (less)	.51	.53	.68	.78	.8	1.0
Total	.84	.78	.88	1.13	1.2	1.3
Total market						
Production	10.35	11.19	13.45	16.16	18.2	25.7
Imports	.72	1.02	1.20	1.31	1.4	1.7
Exports (less)	2.57	3.23	4.10	4.55	5.1	8.2
Total	8.50	8.98	10.55	12.92	14.5	19.2

[1] Market size equals production plus imports (c.i.f.) minus exports (f.o.b.).

Source: Yearbook of Machinery Statistics: 1980, Ministry of International Trade and Industry, 1981. Japan Exports and Imports, Ministry of Finance, 1979-1982. Showa 57 Nen Denshi Kogyo Seisan Mitoshi (Forecast of Production for Electronic Industry in 1982), Electronic Industries Association of Japan, 1982, and International Trade Administration, Office of Trade Information Services research report "International Market Research on Electronic Components—Japan" (see Additional Information box).

Ten of those firms supplied 50 percent of the output. Spurred by strong demand by Nippon Telephone and Telegraph (NTT) for high-quality data communications, the sector's sales are rising an average 11 percent annually and should surpass $7 billion in 1985. Nearly 40 percent of 1980's output went to support NTT requirements.

Telephone equipment manufacturers led the field with a $1.6 billion volume in 1980, and sales should increase another $600 million by 1985. Exchange equipment accounted for 60 percent of the telephone equipment sold in 1980, with much of that strength attributed to NTT's demand for electronic exchanges to replace crossbar switches.

Other non-broadcast equipment sales hit $402 million in 1980 and are poised for a dramatic surge that should see production breaking the $1 billion level in 1985. Growth in the manufacture of facsimile equipment is the basic reason for the industry's healthy outlook. Facsimiles accounted for 90 percent of all non-broadcast equipment produced in 1980. New facsimile technology will offer higher speeds and computer connectability.

Manufacturers of radio communication equipment advanced their production to $1.7 billion in 1980 and expect to see that volume exceed $3 billion in 1985. The popularity of car telephone sets and portable beepers are two major reasons for projected increases in the radio communications industry.

Nippon Electric is one of the most active firms in this sector, producing equipment for every major product category and recording $1.8 billion in communications instrument sales during its 1981 fiscal year. Fujitsu is one of NTT's major suppliers and manufactures both telecommunications and radio communications products. Other major communications equipment producers are Hitachi, Ltd., Iwatsu Electric Co., Ltd., and Toshiba Corp.

Consumer electronics.—The consumer electronics sector recorded sales of $9.3 billion in 1980 and should increase production steadily, topping $11 billion in 1985. The 25 companies that make up this sector manufacture products ranging from refrigerators, washing machines, microwave ovens, home air conditioners, and home sewing machines to electronic calculators, cameras, stroboscopes, and watches. In value terms, the leading product groups in this sector are home air conditioners, watches, cameras, and refrigerators, with projected 1985 sales ranging from $1.7 billion to $2.4 billion each. Electronic calculator production should exceed $1 billion by 1985.

Use of electronic components in this sector vary as widely as the products involved. For example, microprocessors are built into only 5 to 10 percent of the refrigerators produced, while 81 percent of the watches produced are electronic. Among the more notable trends is the replacement of magnetrons by semiconductors in microwave ovens, plus the increased use of microprocessors in these products to add new functions. The development of fully automated microwave ovens is a future technological target.

Among the sector's leading manufacturers are Hitachi, Ltd. ($2.2 billion in consumer product sales in fiscal 1981), Matsushita Electric ($1.9 billion in home electric appliance sales in FY '80), Sanyo Electric Co., Ltd. ($1.7 billion in consumer electronic product sales in FY '80), and K. Hattori & Co., Ltd., leader of the Seiko group ($1 billion in watch sales in FY '81).

Automotive original and replacement equipment. —Although the automotive equipment sector's output of $22.5 billion in 1980 was the largest of any industry utilizing electronic components, its share of the total electronic component market was small because of the still limited application of electronics in this field. At present, car radios and car stereos are the major products in which electronic components are used, and these product groups accounted for only 5 percent of the sector's total output in 1980. Forecasts show car stereo production rising favorably, reaching $1.4 billion in 1985. The market for car radios, on the other hand, is expected to stagnate over the next few years.

In the future, use of electronics are expected to be adopted in the production of electric equipment, display boards, ignition systems, exhaust gas circulation systems, fuel injection systems, diagnostic systems, antiskid systems, and automotive air conditioners.

Clarion Co., Ltd., and Fujitsu Ten Limited are the top producers of car radios and stereos with 1980 sales of those products reaching $248 million and $169 million, respectively. Nippondenso Co., Ltd., which manufactures electronic automotive equipment for

Table 2.—Japan: Imports of selected electronic components by country of origin, 1978-82 and projected 1985
(in millions of U.S. dollars)

	1978	1979	Estimated 1980	1981	Projected 1982	1985
Passive components						
United States	103	147	186	237	260	331
South Korea	65	80	109	112		
Taiwan	34	50	68	67		
West Germany	15	17	22	16		
United Kingdom	5	8	10	8		
All other	91	113	129	138		
Total	313	415	524	578	628	798
Semiconductors						
United States	215	368	340	334	353	375
South Korea	46	53	62	62		
Taiwan	20	29	42	58		
Malaysia	21	21	29	49		
Philippines	14	29	45	40		
All other	62	56	91	120		
Total	378	556	609	663	706	821
Electron tubes						
United States	13	16	20	23	24	29
Taiwan	7	18	29	28		
France	2	3	4	4		
South Korea	5	3	5	2		
Netherlands	3	5	4	2		
All other	2	2	6	6		
Total	32	47	68	65	70	86
Total imports						
United States	331	530	546	594	637	735
South Korea	115	136	176	176		
Taiwan	61	97	140	154		
Malaysia	26	27	34	53		
West Germany	48	38	51	42		
All other	142	190	254	287		
Total	723	1,018	1,201	1,306	1,403	1,705

Source: Japan Exports and Imports, Ministry of Finance, 1979-1982, and International Trade Administration, Office of Trade Information Services research report.

Table 3.—Japan: End-user sector economic indicators, 1980

	Total number of companies	No. of companies accounting for 20% of production	No. of companies accounting for 50% of production	Value of total production ($ 000's)	Capital expenditure ($ 000's)
Home entertainment products	55	2	5	11,111	106
Other consumer electronics	25	3	5	9,288	21
Automotive original and replacement equipment	300	15	64	22,482	873
Test instrumentation	235	3	11	1,390	39
Communications equipment	175	2	10	4,331	784
Industrial control and processing equipment	255	12	21	3,354	230
Electronic medical equipment	65	2	5	645	55
Computers and business systems	155	1	3	7,522	249
Military and aerospace equipment	900	1	41	4,657	3
Total	2,165	41	128	64,780	2,360

Source: Production statistics by Electronic Industries Association of Japan, Japan Machine Tool Builders' Association, Japan Industrial Robot Association, the Defense Agency, Communication Industries Association of Japan, and Yearbook of Machinery Statistics: 1980, Ministry of International Trade and Industry, 1981, and Census of Manufacturers by Enterprises: 1978, MITI, 1981, and International Trade Administration, Office of Trade Information Services research report.

Toyota Motor Co., Mitsubishi Motor Corp., Honda Motor Co., and Toyo Kogyo Co., is one of the major producers of auto electronic systems.

Test instrumentation equipment.—The test instrumentation equipment sector is expected to advance favorably during the 1980-85 period, posting an 11 percent annual growth rate that will see production moving up from $1.4 billion in 1980 to more than $2 billion in 1985. A total of 235 companies contribute to the sector's output, but half of that production is attributed to 11 firms.

Sales of test and measuring devices, which reached $621 million in 1980, are expected to show 14 percent annual growth and rise above $1 billion in 1985. This expansion is based on projected requirements of electric and electronic equipment manufacturers that are being stimulated by increased production of large scale integrated circuits (LSI's) and VTR's. Additional use of electronic components in office equipment, watches, automobiles, and other products will also enhance the call for test and measuring equipment.

Process measuring and control instrument manufacturers logged a production volume of $769 million in 1980 and look for an annual rise of 8 percent, with sales going over $1 billion in 1985. Sparking demand for these instruments is the burgeoning production of data processing equipment. Among the sector's leading producers are Fuji Electric Co., Ltd., Hokushin Electric Works, Ltd., San-ei Instrument Co., Ltd., Takeda Riken Industry Co., Ltd., and Yokogawa Electric Works, Ltd.

Electronic medical equipment.—In value terms, the electronic medical equipment sector is the smallest of all user categories, with a 1980 output of $645 million. Demand for advanced technology in the X-ray and ultrasonic diagnostic areas, however, support a substantial growth rate that should see sales reaching $1.4 billion in 1985. Since many of the 65 companies that comprise this sector are relatively small, and the risks inherent in developing new technology are sizable, the Ministry of International Trade and Industry (MITI) has implemented a system that subsidizes the cost of research and development of important technological programs in the private sector.

Among the Japanese medical equipment industry's top priorities are finding ways to increase the safety and reliability of its products, further miniaturize its products, and provide additional automation and labor-saving benefits. Adoption of LSI's, custom IC's, microprocessors, and other advanced electronic components are being studied as a means of meeting these objectives. The industry is also exploring the use of lasers and microwaves in treatment equipment and seeking applications of positron computerized tomography (CT) and digital radiography in its visual diagnostic products.

Top producers of electronic medical equipment are number-one ranked Toshiba Corp. (X-ray and ultrasonic diagnostic equipment, and electrocardiographic devices) and number two Hitachi Medical Corp. (X-ray and ultrasonic diagnostic equipment).

Industrial control and processing equipment.—With 255 firms contributing to total production in 1980, the industrial control and processing equipment sector rang up sales of $3.4 billion and foresees a 5-percent annual increase that will lift them above $4 billion in 1985.

Largest projected area of growth will be in the manufacturing of industrial robots which should escalate at a 30-percent annual rate, with output leaping from $346 million in 1980 to $1.3 billion in 1985. Meanwhile, machine tool manufacturers expect to hold production steady during the next few years, adding only slightly to the $3 billion recorded in 1980.

Table 4.—Japan: Purchases of electronic components by end-users, 1980-81 and projected 1985
(in millions of U.S. dollars)

	1980	1981	1985
Home entertainment products	5.36	6.40	8.5
Other consumer electronics	.91	1.08	1.4
Automotive original and replacement equipment	.52	.62	1.0
Test instrumentation	.46	.57	.9
Communications equipment	1.14	1.45	2.4
Industrial control and processing equipment	.24	.30	.4
Electronic medical equipment	.24	.34	.7
Computers and business systems	1.63	2.09	3.8
Military and aerospace equipment	.05	.07	.1
Total	10.55	12.92	19.2

Source: Production statistics by Electronic Industries Association of Japan, Japan Machine Tool Builders' Association, Japan Industrial Robot Association, the Defense Agency, Communication Industries Association of Japan, and Yearbook of Machinery Statistics: 1980, Ministry of International Trade and Industry, 1981, and International Trade Administration, Office of Trade Information Services research report.

This expected performance will owe much to an 11-percent increase in the output of numerical control (NC) tools between 1980 and 1985 that will more than offset a projected 9-percent loss in other types of machine tools. NC machine tool sales should approach $2 billion in 1985.

Fujitsu Fanuc, Ltd. is the dominant manufacturer of NC equipment, holding a 60 percent share of the market in 1980. Production of industrial robots is more diffused, with major manufacturers being Kobe Steel, Ltd., Mitsubishi Heavy Industries, Ltd., Nachi-Fujikoshi Corp., Shin Meiwa Industry Co., Ltd., and Yaskawa Electric Manufacturing Co., Ltd.

Military and aerospace equipment.—Nine hundred manufacturers make up the military and aerospace equipment sector. Its output reached $4.7 billion in 1980 and is forecast to total $7 billion in 1985. Japan's Defense Agency is the overwhelming market for these products, buying 90 percent of the sector's output in 1980. The National Space Development Agency of Japan is the only other major market for this equipment. More than 70 percent of the military equipment was produced under contract to the Defense Agency by 20 firms.

Primary output in this sector consists of aircraft, ships, special vehicles, and electronic equipment. One major technological trend is the use of optical fiber cable to reduce weight in aircraft.

Major producers include Mitsubishi Heavy Industries, Ltd. (aircraft, ships, special vehicles), Ishikawajima-Harima Heavy Industries Co., Ltd. (aircraft engines and ships), Fuji Heavy Industries, Ltd. (aircraft), and Komatsu, Ltd. (special vehicles). Leading manufacturers of military and aerospace electronic equipment are Fujitsu Limited, Mitsubishi Electric, Nippon Electric, and Toshiba.

Market Profiles

The vast majority of products required by Japan's electronics industry are supplied by 270 domestic electronic components manufacturers that shared approximately 89 percent of the market in 1980. Because of the wide variety of product types, major component manufacturers produce multiple types of products for end-users. Except for some captive manufacturers, the bulk of domestic producers operate fairly independently. These firms range from the world's largest electronic parts manufacturers to very small enterprises (see table 5).

Total imports of electronic components showed a 67-percent gain between 1978 and 1980, reaching $1.2 billion in 1980. An annual growth rate of 7 percent is forecast for imports through 1985, approaching $2 billion that year. Even so, penetration by foreign suppliers is expected to slip from the 11 percent share set in 1980 to 9 percent in 1985.

Table 5.—Japan: Sales by product, 1980
(in millions of units and millions of U.S. dollars)

	Units	Value
Passive components		
Capacitors	22,949	895
Connectors	680	214
Filters, networks, and crystals	NA	274
Magnetic	NA	1,103
Microwave hardware	NA	1,267
Printed circuit boards	7,200	378
Readout devices	NA	387
Relays	120	178
Resistors	22,117	568
Switches	407	142
Transducers	NA	81
Wire and cable	NA	411
Motors, fractional hp for electronic applications	136	438
Total	NA	6,336
Semiconductors		
Discrete devices	15,736	1,146
Integrated circuits	2,888	2,186
Total	18,624	3,332
Electron tubes		
Receiving	NA	2
Power and special purpose	3	187
Microwave tubes	5	86
TV picture black and white	5	53
TV picture color	12	554
Total	NA	882

Source: Yearbook of Machinery Statistics: 1980, Ministry of International Trade and Industry, 1981. Japan Exports and Imports, Ministry of Finance, 1979-1982. Showa 57 Nen Denshi Kogyo Seisan Mitoshi (Forecast of Production for Electronic Industry in 1982), Electronic Industries Association of Japan, 1982, and International Trade Administration, Office of Trade Information Services research report.

Sales by U.S. firms in 1980 amounted to $546 million or 45 percent of total imports. That volume should swell to $735 million in 1985, although the share claimed by U.S. producers would decline to about 43 percent because of growing activity by Asian suppliers and increasing local manufacturing investments by major U.S. manufacturers, especially in the semiconductor industry.

In 1980, U.S. companies led all other foreign vendors in supplying both passive components and semiconductors. Taiwanese companies held an edge in electron tube sales, but, overall, imports from the United States were more than triple those of its nearest competitor, South Korea.

Semiconductors.—The blossoming semiconductor market in Japan reached $3.3 billion in 1980 and is expected to approach $7 billion in 1985. Imports accounted for 18 percent of semiconductor sales in 1980, with U.S. firms credited with $340 million. By 1985, sales by producers in the United States are forecast to reach $375 million.

The market for **integrated circuits** exceeded $2.2 billion in 1980 and is expected to show 17-percent annual growth that should carry it to $4.7 billion in 1985. Every IC product category is displaying rapid growth; however, MOS IC's have achieved the greatest expansion in recent years.

A $1.1 billion market existed for **discrete devices** in 1980; sales are increasing by 12 percent each year toward a projected $2 billion market in 1985. Production trends indicate areas involved with optoelectronics are among the most promising.

Passive components.—The market for passive components was $6.3 billion in 1980 and is projected to amount to $11 billion in 1985. Growth prospects, however, differ largely according to type of component. Imports represented 8 percent of the passive components market in 1980, but are expected to decline to 7 percent by 1985 in spite of foreign sales rising from $524 million to $798 million during that period. U.S. firms claimed sales of $186 million in 1980 (35 percent of total imports) and should capture 41 percent in 1985, with sales rising to $331 million.

A steadily climbing demand for radio and TV sets is pushing the requirements for **microwave hardware** upward at an annual rate of 10 percent, expanding the market for these components from $1.3 billion in 1980 to a projected $2 billion in 1985. Excluding radio and TV sets for home use, 60 percent of the industrial microwave component market is consumed by producers of radio communication equipment, followed by firms manufacturing products for associated radio and broadcasting equipment.

The $1.1 billion **magnetic components** market in 1980 is continuing on an upward path at a rate of 9 percent each year and should approximate $2 billion in 1985. Creating this activity, in large measure, is the accelerating demand for VTR's, audio equipment, and office equipment including microcomputers. The steady, high-level demand for color TV's is an additional thrust in this area. Some of the fastest growing markets are those for ferrites, output transformers, and coils.

Another market being moved ahead by expanding VTR demand is that for **capacitors,** which stood at $895 million in 1980 and should progress at an 11 percent clip through 1985 when it is expected to reach $2 billion. Also sparking the capacitor market are growing requirements of home electric appliance producers coupled with the pyramiding needs of manufacturers turning out industrial equipment—including computers—and office automation equipment. Due to shortages of aluminum electrolytic capacitors and tantalum capacitors since the second half of 1979, product development has been progressing on alternate devices such as ceramic capacitors.

The expanding market for **readout devices** is expected to jump a phenomenal 26 percent annually between 1980 and 1985, advancing from $387 million to $1.2 billion during that period. Growth is being spurred by demand for display tubes that use semiconductor devices. Light-emitting diode (LED) displays are capturing a 48-percent market share, and liquid crystal displays are holding another 34 percent. Plasma displays, which held a minimal 1 percent of the market in 1980, are forecast to show rapid growth through 1985.

Sharply increasing demand by home appliance manufacturers, particularly makers of VTR's, audio equipment, and color TV's, is creating a ballooning market for **resistors.** Requirements for chip type resistors are expanding because of the trend toward production of smaller, thinner products in these groups. The 1985 resistor market should reach $939 million, significantly above the $568 million total of 1980.

The market for **printed circuit boards** (PCB's), estimated at $378 million in 1980, probably reached more than twice that amount since many PCB manufacturers are small firms not included in official Japanese statistics. This market is showing rapid growth and is expected to hit $809 million in 1985. The production of PCB's for industrial use, consisting of three or fewer conductive layers, are responsible for 66 percent of total output. Production of flexible printed boards and of PCB's with four or more conductive layers have increased significantly since 1978.

Spurred on by new product development, the market for **filters, networks, and crystals** is riding the crest of an annual 21 percent increase that should see it rise from $274 million in 1980 to $709 million in 1985. Networks accounted for 34 percent of total production in 1980, with R/C networks responsible for the majority of that share. Remaining production shares were held, in descending order, by L-C filters, crystal filters, ceramic filters, RFI/EMI, and delay lines.

The demand for fractional horsepower **motors** continued at a high level in 1980, attaining $438 million, and is slated to progress at a 9-percent yearly pace to $660 million in 1985. Once again, the expanding markets for VTR's and office automation equipment are the basis for this projected increase. Among the products in this group showing the most rapid growth are servomotors.

The **wire and cable** products market, which amounted to $411 million in 1980, is projected to move ahead gradually at a 5-percent annual rate to $531 million in 1985. The development of optical fibers is expected to restrain this market to some extent in coming years.

A 9-percent gain is expected each year between 1980 and 1985 for **connectors,** climbing from $214 million to $331 million. Because the production of connectors for in-house use is not counted, the market is probably much larger than the figures indicate. Substitution by opto-electronic devices is considered a threat to the connector market in the future, but its impact should not be felt within the 1980-85 period.

Boosted by development of new, highly reliable devices at low prices, the **transducer** (sensor) market is mounting at a 25-percent annual rate. Demand is forecast to expand from $81 million in 1980 to $243 million in 1985, reflecting a growing variety of applications for transducers in both industrial and domestic areas. Opto-electronic sensors—including image sensors—are expected to expand rapidly, as well as those for sensing temperature, pressure, and moisture.

The market for **switches** approximately $142 million in 1980 and an expanded market of $240 million is predicted for 1985. Push-button and keyboard type switches are in growing demand at the expense of conventional devices such as rotary, seesaw, and lever switches. Compact and thinner type switches are also gaining popularity.

Only slight growth is foreseen for the **relay** market between 1980 and 1985, with sales nudging up from $178 million to $198 million. This holding pattern is due to a combination of declining trends in demand for wire-spring relays and increasing demand for relays for VTR's, automotive electronic components, NC machines, and PCB's used in control apparatus.

Electron tubes.—The market for electron tubes was $882 million in 1980 and is headed for $1.3 billion in 1985. Imports satisfied 8 percent of the market in 1980 and are forecast to increase 5 percent per annum, climbing from $69 million in 1980 to $86 million in 1985. U.S. firms are credited with sales totaling $20 million in 1980, a volume that should increase to $29 million in 1985.

Cathode ray tubes for color TV controlled 63 percent of the total electron tube market in 1980, with sales showing steady growth. Analysts, however, concede that the color TV tube market is already at a saturation stage. Requirements for power and special-purpose tubes are expanding, particularly those for image sensing and storage. The demand for magnetron tubes is substantially increasing, but little growth is predicted for other types of microwave tubes. Diminishing trends are apparent in the markets for cathode ray tubes for black and white TV, and for receiving tubes. Electron beam switched tubes have disappeared from the market.

Marketing Practices

Business practices.—Since application technologies are essential for users of components, the majority of electronic components are distributed directly, in many cases with the aid of local agents. There is a growing trend toward custom manufactured products based on the buyer's specifications, particularly for industrial users.

Imported products are distributed through agents except where components are produced locally or are vended through local sales corporations. Successful distributors often represent several foreign suppliers and are usually eager to take on new items to expand their business front or supplement their existing product lines. Thus, U.S. manufacturers still have a good chance to be represented by local firms if they can provide technologically advanced products and are willing to maintain close contact with their representatives.

Solid relationships between manufacturers (or their agents) and end users are essential for continuous business in Japan. Frequent personal visits and prompt service may occasionally have as much impact on a user's selection of products as product efficiency, quality, or performance. With the Japanese penchant for zero defects, however, reliable, high-quality products are still the most important virtue.

The Japanese practice of high-volume production and deeper ongoing market penetration allows domestic electronic components manufacturers to offer their products at low prices. It is essential for foreign suppliers to keep this practice uppermost in mind and be certain they can compete on these terms before entering this fast-paced market. Terms of payment may differ depending on the financial standing of the purchaser and range from cash on delivery to extended payments. Credit terms usually range from 90 to 120 days. Sales to governmental agencies are generally paid for in cash, while industrial users pay in cash or promissory notes.

Japanese users expect prices to remain relatively stable. This puts many foreign companies at a disadvantage since fluctuations in exchange rates and high inflation in home countries sometimes make it difficult to maintain prices. Most importing companies try to reach some sort of compromise on price changes, agreeing to make changes no more than once or twice a year, or only within a certain range. It is likely, however, that Japanese customers will accept price hikes as long as they are informed of them in advance and are satisfied that the raises are justified.

In Japan, warranties and aftersales service are generally expected as a matter of course. Typical manufacturers' warranties are for one year, but local distributors will occasionally extend them. End users normally expect aftersales service to be provided free or at a nominal charge. There have been some complaints concerning alleged unsatisfactory engineering services by U.S. firms, and some local competitors have established separate companies that specialize in extending such service. The requirement for quality standards in Japan is severe, and thorough discussion of terms concerning replacement of components and liability for losses due to defective products is essential at the start of negotiations.

Most end-users are technologically knowledgeable and keep abreast of their industry through trade journals, seminars, and trade shows. There are approximately 30 specialized publications covering virtually every aspect of the electronics industry in Japan. These periodicals vary from daily trade newspapers to monthly magazines concentrating on narrow segments of the electronics field. Circulations may range from 1,000 to 400,000. In addition, nonspecialized daily newspapers—some with circulations into the millions—also provide product news of a general nature.

End-users and distributors alike apparently appreciate efforts extended by foreign suppliers at exhibitions and trade shows. They seem particularly impressed with product literature translated into Japanese. Major Japanese trade exhibitions include INTERNEPCON Japan, the JPCA (Japan Printed Circuit Association) Show, the Japan Electronics Show, the Chubu Electronics Show, the International Sensor Technology Exhibition and Laser Technology Exhibition, the Exhibition and Conference of New Electrical Insulating Materials, and SEMICON JAPAN. All are held on an annual basis.

No specific laws exist explicitly for regulation of electronic components; however, Japan Industrial Standards (JIS) suggest levels of reasonable quality and usage for industrial products. These standards are not normally enforced, but conformity to them is regarded as highly desirable. Relevant trade associations also have their own established standards and encourage member manufacturers to observe them. No specific pretesting is required for electronic components.

Japanese import duties applicable to electronic components range from free to 10 percent. In general, GATT rates are applied to member countries of the General Agreement on Tariffs and Trade. There are no longer any import quotas or automatic import quotas for electronic products.

Additional Information

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The Survey summarizes a 432-page research report prepared by A. T. Kearney International, Inc., under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
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Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "International Market Research on Electronic Components— Japan," ITA 82-05-514, March 1982.

Japan: Basic Economic Indicators

Population:	118.5 million (1982)	Major trading partners:	United States, Southeast Asia, Middle East
Area:	370,370 sq. km.		
Administrative units:	47 prefectures	Exchange rate:	220 yen=US$1 (1981)
GNP:	$1,028 billion (1982)	Fiscal year:	April 1—March 31
Contributions to GDP:	Services 55% (1980)	Current account balance:	-$10,746 million (1980)
	Industry 41%	International reserves:	$28,403 million (1981)
	Agriculture 4%	Federal budget	
Per capita income:	$8,675 (1982)	revenues:	$101 billion (1980)
Inflation rate:	4.9% (1981)	expenditures:	$168 billion (1980)
Exports f.o.b.:	$149.6 billion (1981)	Labor force:	56.5 million (1980)
U.S. share	26% (1981)	Unemployment:	2.02% (1980)
Imports f.o.b.:	129.5 billion (1981	Average hourly wage:	$5.80 (1982)
U.S. share	17% (1981)		

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International Trade Administration

Despite the current drought that plagues many Australian farmers, long-term expansion in agricultural output is still anticipated. This should mean bright prospects for U.S. suppliers in the local market for agricultural machinery and related equipment, valued at more than $525 million[1] in 1981 (see table 1). Both the conversion of livestock rangeland to grain crops and the availability of irrigation water from several large dam projects are foreseen stimulating steadily rising demand in the next several years. Sales are forecast at some $615 million in 1987. The world recession has recently throttled the export demand that Australian farmers and ranchers rely on, but industry analysts predict a resurgence in agricultural earnings—and equipment purchases—as world economic conditions improve. U.S. manufacturers are certain to benefit from the predicted wave of new investment. Australian holdings are among the largest in the world

Table 1.—Australia: Market for agricultural machinery and agri-related equipment 1980-82 and projected 1987[1]

(in thousands of U.S. dollars)

	1980	1981	1982	1987
Wheeled tractors and parts				
Production	65,000	68,000	62,000	68,000
Imports	148,575	185,807	190,994	203,000
Exports	4,303	9,260	6,638	9,000
Market size	209,272	244,547	246,356	262,000
Harvesting equipment[2]				
Production	25,000	35,000	30,000	40,000
Imports	48,029	66,280	66,119	73,000
Exports	13,778	27,642	12,695	15,000
Market size	59,251	73,638	83,424	98,000
Foraging, silage, and mowing equipment				
Production	35,000	37,000	37,000	45,000
Imports	13,335	15,901	13,155	17,000
Exports	330	400	202	500
Market size	48,005	52,501	49,953	61,500
Plowing and cultivating equipment				
Production	44,000	48,000	48,000	60,000
Imports	8,509	12,885	14,251	16,000
Exports	2,964	4,293	3,648	6,000
Market size	49,545	56,592	58,603	70,000
Planting equipment				
Production	20,000	30,000	32,000	40,000
Imports	1,478	3,045	2,139	3,500
Exports	1,500	9,950	3,500	10,000
Market size	19,978	23,095	30,639	33,500
Fertilizing equipment				
Production	1,000	1,200	1,300	1,800
Imports	1,186	1,378	1,222	1,600
Exports	200	400	50	500
Market size	1,986	2,178	2,472	2,900
Spraying and dusting equipment				
Production	4,000	3,500	3,000	4,500
Imports	3,692	4,927	5,223	8,000
Exports	3,000	1,500	1,000	1,000
Market size	4,692	6,927	7,223	11,500
Irrigation equipment				
Production	5,000	5,500	6,000	8,000
Imports	3,266	3,414	3,451	4,300
Exports	4,747	1,862	1,277	2,000
Market size	3,519	7,052	8,174	10,300
Grain and seed specialty equipment				
Production	1,000	1,500	2,500	4,000
Imports	1,477	2,083	2,417	3,000
Exports	385	866	1,698	2,000
Market size	2,092	2,717	3,219	5,000
Poultry equipment				
Production	1,500	1,000	1,000	2,000
Imports	645	249	172	250
Exports	24	47	82	100
Market size	2,121	1,202	1,090	2,150
Dairy farm equipment				
Production	1,000	1,500	2,000	3,500
Imports	3,296	2,298	803	1,200
Exports	407	870	1,130	1,800
Market size	3,889	2,928	1,673	2,900
Miscellaneous agricultural equipment				
Production	18,000	20,000	22,000	27,000
Imports	5,530	5,720	3,725	6,000
Exports	2,553	4,132	5,000	8,000
Market size	20,977	21,588	20,725	25,000
Agricultural aircraft				
Production	5,000	3,000	1,000	5,000
Imports	23,085	31,033	28,249	33,000
Exports	8,038	2,423	232	8,000
Market size	20,047	31,610	29,017	30,000
Total market				
Production	225,500	255,200	247,800	308,800
Imports	262,103	335,020	331,920	369,850
Exports	42,229	63,645	37,152	63,900
Market size	445,374	526,575	542,568	614,750

Table 1.—Australia: Market for agricultural machinery and agri-related equipment 1980-82 and projected 1987[1]*—Continued*

(in thousands of U.S. dollars)

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Parts are excluded.

[2] Includes vegetable (truck) farming equipment.

Source: International Trade Administration, Office of Trade Information Services research report, Australian trade statistics, and trade source estimates.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1 = .8696 Australian dollars (1980), .8696 Australian dollars (1981), and 1.00 Australian dollars (1982 and subsequent years). Values through 1982 are expressed in current rather than constant dollars; values for 1983 and subsequent years are expressed in 1982 constant dollars.

and are ideally suited to the giant machines that represent top-of-the-line American tractor and harvester offerings. U.S. firms captured 52 percent of Australian farm machinery imports in 1981 and are projected to raise their sales some 2.5 percent a year to $200 million in 1986 (see table 2).

Australia's vast potential for agricultural expansion underlies the optimistic long-term outlook for machinery sales. The island continent has huge tracts of land still underutilized, and a major expansion in farming is likely between now and the end of the century. Newly-developed crop varieties and growing techniques allow more productive use of land, ensuring that Australia will remain one of the major grain baskets of the world. Modern medicines, chemicals, and machinery have already

Table 2.—Australia: Imports of agricultural machinery and agri-related equipment by country of origin 1980-82, and projected 1987

(in thousands of U.S. dollars)

	1980		1981		1982		1987	
	Value ($)	Share (%)	Value ($)	Share (%)	Value ($)	Share (%)	Value ($)	Share (%)
Wheeled tractors and parts								
United States	66,081	45	87,274	47	100,012	52	107,500	53
Germany	18,697	13	16,280	9	21,571	11	20,550	10
Italy	8,890	6	22,119	12	13,999	7	17,100	8
United Kingdom	22,841	15	27,633	15	13,874	7	25,200	13
Belgium Lux.	5,600	4	9,801	5	4,838	3	5,000	2
Others	26,466	17	22,700	12	36,700	20	27,650	14
Total	148,575	100	185,807	100	190,994	100	203,000	100
Harvesting equipment								
United States	24,823	52	43,945	66	40,750	62	47,400	65
Germany	7,611	16	9,957	15	10,300	15	11,000	15
Belgium Lux.	4,548	9	5,561	8	8,304	13	7,300	10
Canada	8,955	19	4,355	7	4,729	7	5,800	8
Italy	1,480	3	1,813	3	1,571	2	1,500	2
Others	612	1	649	1	465	1	—	—
Total	48,029	100	66,280	100	66,119	100	73,000	100
Foraging, silage, and mowing equipment								
United States	5,845	44	7,300	46	6,106	47	8,500	50
Germany	672	5	1,260	8	2,095	16	2,700	16
France	2,290	17	3,724	23	1,222	9	2,000	12
United Kingdom	1,038	8	1,068	7	280	2	1,000	6
Denmark	851	6	984	6	547	4	900	5
Others	2,639	20	1,565	10	2,905	22	1,900	11
Total	13,335	100	15,901	100	13,155	100	17,000	100
Plowing and cultivating equipment								
United States	5,300	62	5,278	41	56,792	41	6,400	40
Canada	1,999	23	2,911	23	4,398	31	5,600	35
New Zealand	660	8	1,058	8	1,050	7	1,300	8
Italy	479	6	1,230	10	844	6	1,100	7
Japan	49	1	875	7	477	3	800	5
Others	22	—	1,533	11	1,690	12	800	5
Total	8,509	100	12,885	100	14,251	100	16,000	100
Planting equipment								
United States	232	16	631	21	636	30	1,050	30
New Zealand	478	32	1,251	41	1,007	47	1,700	49
United Kingdom	536	36	712	24	141	7	500	14
Norway	24	2	101	3	77	4	100	3
Others	208	14	350	11	278	12	150	4
Total	1,478	100	3,045	100	2,139	100	3,500	100
Fertilizing equipment								
United States	113	10	118	9	99	8	160	10
Netherlands	421	36	413	30	417	34	560	35
Italy	106	9	367	27	131	11	210	13
United Kingdom	224	19	260	19	111	9	210	13
New Zealand	153	13	88	6	93	8	140	9
Others	169	13	132	9	371	30	320	20
Total	1,186	100	1,378	100	1,222	100	1,600	100

Table 2.—Australia: Imports of agricultural machinery and agri-related equipment by country of origin 1980-82, and projected 1987 —Continued

(in thousands of U.S. dollars)

	1980		1981		1982		1987	
	Value ($)	Share (%)	Value ($)	Share (%)	Value ($)	Share (%)	Value ($)	Share (%)
Spraying and dusting equipment								
Korea	87	2	735	15	1,129	22	2,240	28
Denmark	850	23	960	20	847	16	1,280	16
United Kingdom	421	11	413	8	400	8	640	8
Japan	439	12	592	12	371	7	800	10
Italy	797	22	446	9	364	7	560	7
Others	1,098	30	1,781	36	2,112	40	2,480	31
Total	3,692	100	4,927	100	5,223	100	8,000	100
Irrigation equipment								
United States	1,968	60	2,679	78	2,016	59	2,580	60
Israel	534	16	475	14	840	24	1,210	28
Germany	16	—	31	1	218	6	130	3
New Zealand	44	1	120	4	217	6	340	8
Others	704	22	109	2	160	5	40	1
Total	3,266	100	3,414	100	3,451	100	4,300	100
Grain and seed specialty equipment								
United States	721	49	769	37	1,297	54	1,650	55
Netherlands	243	16	512	25	464	19	600	20
New Zealand	147	10	95	5	238	10	300	10
United Kingdom	54	4	174	8	29	1	150	5
Switzerland	—	—	84	4	—	—	—	—
Others	312	21	449	21	389	16	300	10
Total	1,477	100	2,083	100	2,417	100	3,000	100
Poultry equipment								
United States	121	19	121	49	84	49	120	48
United Kingdom	201	31	86	35	46	27	60	24
France	51	8	8	3	22	13	40	16
New Zealand	24	4	30	12	13	8	20	8
Italy	—	—	3	1	—	—	—	—
Others	248	38	1	—	7	3	10	4
Total	645	100	249	100	172	100	250	100
Dairy farm equipment								
United States	363	11	122	5	346	43	300	25
New Zealand	151	5	1,005	44	136	17	240	20
Germany	168	5	130	6	46	6	70	6
Denmark	110	3	537	23	12	1	180	15
Sweden	646	20	421	18	—	—	180	15
Others	1,858	56	83	4	263	33	230	19
Total	3,296	100	2,298	100	803	100	1,200	100
Miscellaneous agricultural equipment								
United States	2,587	47	2,336	41	2,069	56	3,000	50
United Kingdom	565	10	341	6	658	18	900	15
New Zealand	268	5	386	7	414	11	800	13
Sweden	146	3	1,331	23	105	3	600	10
Italy	217	4	371	6	76	2	300	5
Others	1,747	31	955	17	403	10	400	7
Total	5,530	100	5,720	100	3,725	100	6,000	100
Agricultural aviation								
United States	22,802	99	23,277	75	17,982	64	21,400	65
Israel	92	—	7,508	24	9,923	35	11,600	35
Others	191	1	248	1	344	1	—	—
Total	23,085	100	31,033	100	28,249	100	33,000	100
Total imports	262,103		335,020		331,920		369,850	
Total imports from U.S.	130,956		173,850		177,189		200,060	
U.S. share of total imports		50		52		53		54

Source: International Trade Administration, Office of Trade Information Services research report, Australian trade statistics and trade source estimates.

permitted an expansion in livestock and crop production. And agriculturists are launching such new livestock enterprises as raising angora goats and cultivating tropical fruits, cotton, oilseeds, and edible nuts.

Selected Equipment Markets

Demand for **tractors** waned in 1980 as a result of the drought that struck much of Australia's agricultural heartland; the number of units sold fell from 14,000 to 13,000. But sound prospects for sugarcane growers in Queensland, a more encouraging outlook for wheat, and heavy discounting led to record purchases in 1981. At $245 million, sales of tractors in 1981 were their highest ever as some 16,500 units found their way from showrooms to machinery sheds. Because the tractor market is intensely competitive, manufacturers have released many new models over the past several years. Both 2-wheel and 4-wheel drive designs are popular, provided they can withstand the heavy use imposed on them by Australian conditions. Despite the need for power and ruggedness, farmers increasingly demand machines that are also easy to service and designed for operator comfort.

Sales of **harvesters** amounted to some $60 million in 1980, and analysts noted little growth in demand through 1981, when about 2,300 harvesters were purchased. Farmers have tended to buy the larger machines offered by both domestic and overseas manufacturers. However, the costliness of the biggest, most sophisticated harvesters may encourage farmers to buy cooperatively in the future. Self-propelled harvesters currently outsell tractor-drawn models nearly two to one. The shift to self-propelled harvesters is projected to continue unless the greater creature comforts and versatility of tractors make farmers reluctant to leave their cabs. Small self-propelled grain combines with a drum width of less than 50 inches are also expected to lose favor to drum and rotary models of larger machines. Anticipated expansion in grain planting, as well as the addition of alternative crops, such as sugarcane and cotton, should sustain demand for harvesters in the future.

Imports of **forage, silage, and mowing equipment** rose from $13.3 million in 1980 to $15.9 million in 1981, though total sales reportedly remained static as a result of drought in some forage-growing areas. Australian farmers bought nearly 7,800 mowers, mostly slasher type, and 1,333 hay balers. Round and other large balers accounted for 273 of the sales, and local industry specialists predict that demand for round balers will continue to grow at the expense of conventional equipment. The market for pickup balers fell to 480 units in 1981 (from 806 in 1980), and sales of hay rakes declined to 1,118 (from 1,394 the previous year).

Table 3.—Australia: Agricultural land utilization by state, 1980

(in thousand hectares[1])

	Crop-land[2]	Sown pasture	Other uses[3]	Total
Principal agricultural states				
New South Wales	5,243	6,024	53,739	65,006
Victoria	2,248	5,671	6,816	14,735
Queensland	2,334	3,170	152,217	157,721
South Australia	2,771	3,211	56,804	62,796
Western Australia	5,281	7,141	102,501	114,923
Tasmania	79	895	1,255	2,229
Northern Territory	2	374	77,792	78,168
Australian Capital Territory	1	25	35	61
Total	17,959	26,511	451,159	495,639

[1] Hectare = 2.47 acres.

[2] Excludes duplication on account of area double cropped. Excludes pastures and grasses harvested for hay, seed, and green feed or silage which have been included in sown pastures.

[3] Used for grazing, lying idle, fallow, etc.

Source: Australian Bureau of Statistics

Local manufacturers dominate the market for **plowing and cultivating equipment** with sales amounting to $49.5 million in 1980. Domestically built plows, harrows, and cultivators have the advantage of being designed to withstand the tough use imposed by Australia's heavy soils. Foreign implements are considered too light by many farmers, and imports totaled just $8.5 million in 1980. Sales of disc and moldboard plows, disc harrows, and tine cultivators are expected to remain stable, while slight growth is forecast in the market for chisel plows, blade plows, and scarifiers. Some industry specialists forecast a trend toward stubble mulch and other soil-conserving cultivation practices.

The $20 million (1980) market for **planting equipment** is also supplied largely by Australian vendors, whose broadcast seeders are ranked among the best in the world. Grain drills still outsell broadcast seeders, though agricultural engineers predict a swing to air seeders in the dryland areas and to sod seeding equipment on irrigated land. In 1981, farmers purchased 1,900 grain drills, 710 broadcast seeders, and 290 row crop planters.

Demand for **fertilizing equipment,** used primarily on pasture, wheat, and sugarcane acreage, is met about equally by domestic and foreign manufacturers. Sales totaled some $2 million in 1980. The market for **spraying and dusting equipment** is supplied largely by overseas vendors, with imports totaling $4.9 million in 1981, a 33 percent increase over the previous year. Here, too, buyers are looking for durability, since equipment has been known to fail under rough Australian conditions. Market trends are said to favor expanded use of lower volume and controlled droplet application.

Because water supply continues to pose the major obstacle to expanded Australian agricultural activity, sales of **irrigation equipment** have excellent growth potential. Most irrigation pumps are made locally, while imports of irrigation equipment other than pumps amounted to $3.4 million in 1981.

The market for **grain and seed specialty equipment** is largely served by a well-established local industry. A South Australian firm reportedly supplies 50 percent of the market for grain and seed sorting, grading, and cleaning equipment. Smaller local companies also compete, and foreign vendors provide much of the grain and seed testing equipment. Even so, imports rose to $2 million in 1981, up 41 percent over the value of 1980 shipments.

Demand is declining for both **poultry equipment** and **dairying equipment.** A surge of expansion in the poultry industry left many establishments overcapitalized. As a result, sales of poultry equipment slumped in 1981 and are unlikely to pick up for several years. Imports fell from $645,000 in 1980 to $249,000 in 1981. The dairy industry has in recent years stabilized following a long period of decline and consolidation. However, the market for dairy equipment is expected to remain sluggish. Imports fell from $3.3 million in 1980 to $2.3 million in 1981 and are forecast to remain below the $2 million mark through the mid-1980's.

In Australia, the market for **miscellaneous agricultural equipment** consists primarily of presses, crushers, and similar machinery. Items with greatest potential are those used for preparing fruit juices, which Australians are consuming in growing quantities. Demand for beekeeping equipment, on the other hand, is currently weak because of low honey prices. Sales of miscellaneous agricultural equipment totaled $21.6 million in 1981, of which only $5.7 million worth was imported the previous year.

Agricultural aviation equipment in Australia is used primarily for seeding, spraying, and dispersing superphosphate over pastureland. Escalating fuel prices and rising farm costs have caused a decline in air applications over the past several years; agricultural flying time fell 20 percent from 1980 to 1981. Most of the equipment used in Australia comes from the United States, which in 1981 accounted for nearly 75 percent of the $32 million in sales of noncargo aircraft weighing under 4,400 pounds unladen.

Competitive Environment

Despite an impressive volume of local production that was valued at some $225 million in 1980, Australia depends on imports for about 60 percent of its agricultural equipment needs. Purchases of foreign-built machinery amounted to $335 million in 1981 and are projected to show steady growth after 1982, reaching $370 million in 1987.

U.S. suppliers.—American manufacturers hold a commanding position of strength on the Australian market, accounting for over half of total imports in 1981 with equipment worth nearly $174 million. U.S. companies further enhance their role by participating in local manufacturing ventures and shipping to Australia from third-country subsidiaries. Local equipment buyers consider U.S.-built offerings reliable, technologically advanced, well made from high-quality materials, comfortable, and relatively easy to handle. They rate U.S. tractors and harvesters as the best on the market. Not surprisingly, American suppliers outsell all other vendors of large tractors of 80+ horsepower (hp) with 55 percent of imports in 1981, and of harvesters, with 66 percent of imports. U.S. firms also do well with irrigation equipment (78 percent of imports) and agricultural aviation equipment (75 percent of imports).

Many of the big American equipment makers are represented here. John Deere, International Harvester, Sperry New Holland, and J. I. Case all have local manufacturing or assembly operations. They supplement their stock of domestically fabricated machinery with shipments from stateside plants. For example, Chamberlain John Deere, which is 49 percent owned by Deere, builds tractors in Australia but sells John Deere combines from American factories. Other companies, including Allis-Chalmers, Ford, and Steiger, concentrate on shipping U.S.-built tractors, harvesters, or other equipment. U.S.-designed soil preparation equipment has not been as well received as other types of American machinery. To expand their share of the implement market, local observers say, American suppliers of plowing and cultivating equipment should beef up their offerings to stand up to the rugged conditions of the Australian outback.

Domestic suppliers.—Locally, some 214 establishments employ approximately 12,000 workers to manufacture agricultural machinery and equipment. Most build at least some machinery under license to American firms. Output has climbed steadily over the past few years, rising a sharp 13 percent between 1980 and 1981. Forecasts indicate annual expansion of some 4.5 percent a year over the 1982-87 period, bringing the value of output to $309 million in the latter year.

The Australian Government supports the domestic industry with a bounty paid to domestic manufacturers of tractors with a minimum local content of 55 percent. The amount paid depends on the exact amount of local content and the power of the tractor. In 1981, some $8 million in bounties was disbursed to the local industry. In addition, imports that compete with similar domestically built agricultural equipment are subject to relatively high tariffs of 15-35 percent. No substantial reductions in tariffs are anticipated in light of the current economic climate.

Tractors and soil cultivating implements account for the largest share of Australian production of agricultural equipment. Output of tractors (about 4,000 units valued at over $60 million a year) is provided mostly by Chamberlain John Deere with 35 percent of total sales. International Harvester's Australian subsidiary also manufactures locally. Domestically-owned builders of tractors include Phillips Acremaster. As much as 14 percent of the local industry's output of tractors is shipped abroad: exports amounted to some $9.3 million worth in 1981.

Local manufacturers also do well with plows, cultivators, weeders, hoes, and harrows designed for Australian conditions. Output of such implements, about $44 million in 1980, is largely sold at home; less than 10 percent of production is exported. Prominent vendors include Chamberlain, Conner Shea Holdings, Horwood Bagshaw, Napier, and John Shearer. Smaller manufacturers of soil preparation equipment include Agricultural Implement Manufacturers, selling under the Jarrett name; Alfarm Industries, which also makes seeding equipment; and Symonds Products, offering plows, seeders, cultivators, and rakes.

Australian production of planting equipment was valued at nearly $20 million in 1980. Exports, which amounted to just $1.5 million in 1980, surged to some $10 million the following year. Such implement manufacturers as Alfarm, Chamberlain, Conner Shea, John Shearer, Napier, and Symonds all produce planters and seeders.

Domestic vendors also do well with irrigation equipment. All but 10 percent of the pumps sold in Australia are built locally, and three local manufacturers control about 55 percent of the market for field irrigators. Avokah Irrigation and Toowoomba Foundry are prominent suppliers.

Australian manufacture of most other categories of equipment is relatively minor. Industry sources report that some feeding and watering units and cages are built by domestic suppliers of poultry equipment, but that most incubators and poultry processing equipment are imported. The decline of Australian dairying has led to a drop in the number of local manufacturers of dairy farm equipment, and most now concentrate on assembling imported components. The sole Australian manufacturer of aircraft and implements for aerial agriculture, Transavia, has built 115 aircraft over the past 13 years, but most were exported.

Third-country suppliers.—Overall, no single third-country source seriously threatens American dominance of the Australian market. However, some vendors have made substantial inroads in individual markets.

British manufacturers capture the largest third-country share, accounting for 9.2 percent of imports with sales of $30.7 million in 1981. The United Kingdom has longstanding Commonwealth-based economic ties with Australia, helping U.K. firms to supply 40 percent of 60-80 hp tractors, 11 percent of 80+ hp tractors, 24 percent of planting equipment, and 19 percent of fertilizing equipment bought from abroad. Established vendors include David Brown, Dalgety, Simon, Howard Machinery, British Leyland, and R. A. Lister.

Suppliers from Germany provided agricultural machinery valued at $27.7 million in 1981, supplying 8.3 percent of imports. Most of Germany's shipments are accounted for by tractors ($16.3 million) and harvesting equipment ($10 million). Deutz and Daimler-Benz are leading competitors.

Success in the market for tractors also explains Italy's prominent role (7.9 percent of imports with sales of $26.4 million). Italian firms such as FIAT and SAME & Lamborghini accounted for 21 percent of imported tractors of 60-80 hp and 10 percent of over-80 hp tractors in 1981. In addition, Australian farmers bought 10 percent ($1.2 million) of their imported plowing and cultivating equipment and 27 percent ($367,000) of their imported fertilizing equipment from Italy.

Among other competitors, factories in Belgium accounted for substantial imports of large tractors ($9.8 million) and harvesting equipment ($5.6 million). Canadian suppliers, including EMCO Wheaton, Massey-Ferguson, and Versatile, have made impressive gains in the market for plowing and cultivating equipment, providing 23 percent of imports of such machinery in 1981. Vendors from New Zealand, with sales of more than $4.1 million in 1981, do well with dairy farm equipment, plowing and cultivating implements, and planters. Japan accounted for 7 percent ($1.8 million) of small tractor imports in 1981. Kubota and Shibaura are among the firms contributing to the more than $3.3 million total volume of Japanese-source shipments to Australia.

Major Purchasers

Although Australia comprises roughly the same land mass as the United States, agricultural land use patterns are sharply different, primarily because of the much lower levels of rainfall in much of Australia. Nearly two-thirds of the country receives less than 20 inches of rain per annum; only 6.5 percent receives more than 40 inches (compared to 43 percent of the United States). As a result, cropland amounts to about 3 percent of Australian land versus 20 percent in the United States, while grazing land comprises 54 percent versus 36 percent in the United States. The most important products are wheat and sheep, which are often raised together. These giant grain/livestock operations constitute the backbone of Australian agriculture and make up much of the demand for agricultural machinery and related equipment.

Australian farms are expected to generate receipts of some $13.6 billion in 1982. Most of the output is exported: 80 percent of wheat, barley, sugar, and wool, 70 percent of mutton, and 50 percent of beef production is shipped overseas. In all, export earnings should top $8.5 billion, almost half of the nation's total export receipts. Recession in the United States and Japan, coupled with the agricultural policies of the European Economics Community (EEC), has caused a deterioration in the short-term outlook for Australia's overseas sales. But agricultural economists foresee strong demand in the long run as world populations and incomes grow. Unlike most farming regions, Australia has the potential to boost acreage, not just yields. Pasture land is being planted in crops, and irrigation is opening up whole new areas to cultivation.

Australia's leading groups of buyers of agricultural machinery and related equipment will be profiled below. Virtually all farming is done under private ownership, so there will be no discussion of cooperative or state farms.

Large and medium-size private farms and plantations.—Large-scale cultivation of cereal grains, primarily wheat, barley, corn, and sorghum, is the most important agricultural activity in Australia, yielding sales of some $3.9 billion in 1982. Nearly 47,000 farms produce grains, either alone or in conjunction with sheep or cattle raising (see table 4). Wheat, the single most valuable grain produced, was planted on 29 million acres in 1982. Plantings are forecast at 34 million acres by 1986. The average size of wheat farms exceeds 4,600 acres; nearly twice that if sheep are raised on the same farm. Grain farmers are using new varieties as well as huge tractors, attachments, and harvesters to farm thousands of additional acres of wheat each year. Expansion of barley and legumes as rotation crops is also likely, particularly in southern Australia.

Sugarcane, another important cash crop, is raised primarily along the coast from northern New South Wales to North Queensland. In 1980, the more than 6,300 establishments growing cane on some 714,000 acres earned a record gross income of $1.4 billion. Entry into the industry is tightly regulated, but efforts are underway to establish production in the Ord River Valley in Western Australia.

Cotton growing is a relatively new industry in Australia, having been launched in the early 1960's. Growers, who are centered in New South Wales and Queensland, expect to harvest 530,000 bales from over 250,000 acres. Water from new dams and the recent phenomenon of investment in agricultural land by investor syndicates has made cotton something of a glamor crop in Australia and led to rapid growth in plantings over the past few years. There were 213 establishments growing cotton in 1980 (up from just 139 in 1978), ranging in size

Table 4.—Australia: Agricultural enterprises by industry class and legal status, 1980

	Sole operator	Family partnership	Other partnership	Private corporation	Public corporation	Others[1]	Total enterprises
Poultry	454	1,082	68	154	8	28	1,794
Grapes	1,390	3,081	115	117	5	36	4,744
Plantation fruit	718	1,278	57	41	—	17	2,111
Orchard and other fruits	2,170	4,345	193	283	6	49	7,046
Vegetables	2,084	4,262	145	212	3	57	6,763
Cereal grains	4,623	12,595	560	848	28	401	19,055
Sheep, cereal grains	4,511	16,148	635	1,002	12	487	22,795
Meat cattle, cereal grains	1,413	3,094	178	304	4	102	5,095
Sheep, meat cattle	3,840	6,654	527	802	16	329	12,168
Sheep	6,437	10,776	752	944	22	535	19,466
Meat cattle	13,138	15,040	1,063	1,666	52	772	31,731
Milk cattle	5,968	13,322	388	460	11	352	20,501
Pigs	970	1,977	86	106	3	25	3,167
Sugarcane	1,359	4,501	127	152	3	109	6,251
Peanuts	110	310	3	10	1	10	444
Tobacco	221	644	31	13	2	20	931
Cotton	29	116	21	35	—	10	211
Nurseries (except forest nurseries)	494	790	119	179	3	16	1,601
Others	3,092	2,672	301	378	9	76	6,528
Totals	53,021	102,687	5,369	7,706	188	3,431	172,402

[1] Includes cooperative societies and trusts.

Source: Australian Bureau of Statistics.

from 25 acres to 60,000 acres. The industry operates at close to 70 percent of capacity, and further expansion is limited by lack of irrigated areas and by pests. Efforts to establish cotton in the Ord River Basin were abandoned in 1975 because of insect problems.

Irrigation has also been responsible for rapid expansion in rice plantings. Good returns and a bountiful supply of irrigation water led to record rice plantings in 1982: an estimated 311,000 acres. Most of the acreage is located in New South Wales; some is in Queensland and Western Australia. An attempt is being made to establish the industry in the Northern Territory.

Several sectors of Australia's fruit industry have recently fallen on hard times due to stiff competition in export markets and declining local consumption. Production of apples (310,000 tons in 1982) and pears (115,000 tons) for canning is expected to be cut back by as much as one-third; output of peaches (80,000 tons) and apricots (27,000 tons) has also been severely curtailed by recent problems in the canning industry.

For growers of citrus fruits, the picture is brighter. Production in 1981 was a record 605,000 tons, with almost 60 percent going to juice processors. Juice consumption is said to be increasing some 15-20 percent per annum. Sales of bananas, the third largest selling fruit in Australia after oranges and apples, amounted to 138,000 tons in 1980. Other tropical crops grown, primarily in Queensland, include pineapples (134,000 tons in 1982), avocados, mangos, rockmelons, and guavas.

Major dairy farming operations.—The 20,500 dairy farms in Australia averaged some 380 acres and 160 milk cows each in 1980. Over half of the farms are located in Victoria. A massive shakeout over the past decade cut milk output dramatically, and production now just exceeds local demand. The long-term output has brightened substantially as a result of extensive marketing campaigns that have succeeded in increasing annual milk consumption by 14 million gallons over the past 5 years. Cheese consumption, too, climbed some 18 percent from 1979 to 1981. The increased returns to dairy farmers anticipated in the future could mean renewed demand for agricultural equipment from this sector.

Major dairy farming operations.—The 20,500 lian poultry industry has developed rapidly since 1970; both output and consumption have risen sharply. Breeding advances and organization into large enterprises have boosted efficiency and cut production costs, making chicken the second most important meat item (after beef) in the Australian diet. Chicken consumption is expected to stabilize at current levels over the next 5 years. In 1980, the number of establishments producing poultry numbered 660. Broilers accounted for 90 percent of output. Trade sources say that recent consolidation has left management decisions for 70 percent of the industry in the hands of just four business groups.

Egg production, amounting to 2.4 billion eggs from more than 1,100 establishments in 1981, is tightly controlled by production quotas in every State except Tasmania. Large operations, which are highly automated, coexist with small operations selling from roadside stores. For 1982, all States imposed substantial seasonal cuts in hen quotas to reduce production to around 2 billion eggs.

Cattle/livestock farms and ranches.—About 63,000 farmers raised only livestock; another 28,000 combine sheep or cattle rearing with grain cultivation. The sheep population declined to 134.4 million in 1981 as a result of drought in New South Wales and Queensland, but industry observers expect the flock to be rebuilt at a rate of 2-3 percent per annum until at least 1985. Despite competition for land as more acreage is devoted to crops, the strong markets for sheep meat, live sheep, and wool are forecast to ensure steady growth in sheep numbers.

The Australian beef and veal industry has been similarly hit by drought. Moreover, it has also faced depressed world beef prices and the beef substitution scandal ("Slaughtergate") in late 1981. The size of the national herd peaked at 33.4 million in 1975 and has since declined, to 22.4 million in 1981. The Australian Meat and Livestock Corporation predicts that the herd will rebuild to 27 million by 1985. Production is highly concentrated; about 20 percent of the cattle ranchers control almost 80 percent of the herd. Beef producers traditionally specialize (56 percent do not raise crops or other livestock), but there is a trend to diversification. Average size of cattle-only establishments is estimated at over 20,000 acres. Farmers in the southern half of the country are increasingly switching to grain crops and sheep, concentrating the national herd in the traditional cattle areas of north Queensland, the Northern Territory, and the Kimberlys.

The sharp hike in feed grain prices resulting from the drought caused a liquidation of hog numbers in 1980 that continued into 1981. Pork production peaked at about 257,000 tons in 1981 and was expected to decline to around 250,000 tons in 1983. Large, intensive producers dominate. About 70 of the more than 3,000 establishments raising pigs in Australia account for 30 percent of total pork production and 20 percent of breeding sows.

Market Access Data

Foreign suppliers of agricultural machinery and equipment successfully use several distribution channels. Some give exclusive distribution rights to a separate Australian company that has a network of agencies. Some set up an Australian subsidiary to handle their equipment. Others import some equipment and also manufacture in Australia.

Purchases are usually made from a local dealer, but the purchase decision is often made at an agricultural field day exhibition. The local dealer's ability to back up sales with spare parts and service is a vital factor. Obtaining parts is often complicated by the great distances between depots and limited transportation facilities in many agricultural regions. Moreover, Australia's fairly frequent strikes and other industrial disputes often disrupts distribution systems. In addition to service and parts support, buyers also weigh performance and reliability heavily when selecting equipment. Buyers do not cite cost as a major criterion, but dealers point out that a price war in 1981 caused tractor sales to soar to their highest level since 1976.

Additional Information

The project officer responsible for Country Market Surveys on Agricultural Machinery and Equipment is:

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The Survey summarizes an 81-page International Market Research (IMR) report prepared by the U.S. Foreign Commercial Service in Sydney and reflects the opinions and views of interviewees in Australia. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

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U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Australia's mineral resource boom has begun to slow down, leading to curtailment of some major mining and related projects. Yet planned investment in raw materials development still stands at a substantial $37 billion[1]. The anticipated stimulus to all sectors of the economy is expected to fuel rapid expansion in the market for computers and related equipment. From an estimated $587 million in 1982, sales are projected to expand 24 percent yearly, topping $1.7 billion in 1987 (see table 1). Australia's nonfuel mineral commodities, which are important foreign exchange earners, face declining world markets, but energy resources—coal, uranium, and oil—continue to do very well. As general business activity is stimulated, labor costs are expected to surge in this traditionally high-wage economy, prompting thousands of managers to look to computers and peripherals as a means of controlling expenses. The improving price/performance ratio of electronic data processing (EDP) hardware, the diminishing initial investment required to computerize, and the availability of inexpensive packaged software are luring businesses of all sizes into the computers and related equipment market. A growing number of Australian executives, especially younger ones, have become thoroughly familiar with computers and actively promote their application in business, industry, and government.

Despite rapid growth in domestic production, particularly of minicomputers and add-on peripherals, imports continue to dominate the market, with overseas purchases of over $1.6 billion foreseen by 1987. American manufacturers provide Australian users with most of the country's computers and peripheral equipment. U.S. sales are estimated at $300 million in 1982 and are expected to rise some 24 percent a year to $865 million in 1987, representing over half the total market (see table 2).

Fastest expansion is foreseen in the markets for minicomputers and peripherals where home production is concentrated. Sales of minicomputers are projected to quadruple over the 1982-87 period, and the mini population is expected to increase from 7,100 in 1981 to some 24,000 by 1987 (see table 3).

Product Category Definition

Products covered in this Country Market Survey include: minicomputers; small, medium, and large computers (general purpose digital, analog, and hybrid); computer peripherals (auxiliary storage/memory equipment, data entry devices, output devices, computer terminals, and computer peripheral controllers and interface devices); and data communications equipment (communications processors, modems and data sets, acoustic couplers, multiplexors, and concentrators). For a more complete description of the types of peripherals covered, see the Product Category Guide insert in the "Global Market Survey—Computers and Peripheral Equipment."

Table 1.—Australia: The market[1] for computers and peripheral equipment, 1979-82 and 1987

(in millions of U.S. dollars)

	1979	1980	1981	1982	1987
Minicomputers					
Production	4.00	6.00	10.80	14.00	56.0
Imports	60.42	68.84	92.15	119.00	455.0
Exports[2]	2.60	3.00	3.65	5.00	21.0
Market size	61.82	71.84	99.30	128.00	490.0
Small, medium, and large computer systems					
Production	1.80	2.00	2.30	2.50	6.0
Imports	228.34	210.44	268.44	320.00	750.0
Exports	6.67	7.39	7.75	7.50	16.0
Market size	223.47	205.05	262.99	315.00	740.0
Peripherals (sold separately)[3]					
Production	10.80	12.10	16.00	21.00	75.0
Imports	56.86	61.76	78.58	101.00	365.0
Exports	4.45	5.04	5.70	7.00	25.0
Market size	63.21	68.82	88.88	115.00	415.0
Data communications equipment (sold separately)[3]					
Production	19.60	20.20	22.20	25.00	60.0
Imports	9.78	11.87	13.90	15.00	38.0
Exports	8.49	9.52	10.60	11.00	28.0
Market size	20.89	22.55	25.50	29.00	70.0
Totals					
Production	36.20	40.30	51.30	62.50	197.0
Imports	355.40	352.91	453.07	555.00	1,608.0
Exports	22.21	24.95	27.70	30.50	90.0
Market size	369.39	368.26	476.67	587.00	1,715.0

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Australian exports include significant amounts of re-exports.

[3] Excluding equipment sold as components of integrated computer systems.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Australia" (see Additional Information box). Figures in this report are based on data gathered in Australia, including available government statistics, industry reports, and trade source estimates and projections.

Technologically improved mini's can do more jobs and do them better than ever before. Australians use them in computer-aided design (CAD) and manufacture (CAM), process control, word processing, and distributed processing networks. The swift expansion in the market for peripherals results from the recent acceptance of plug-compatible equipment

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[1] All statistics in this Survey are based on the Australian fiscal year (July-June); the year indicated (e.g., 1981) refers to the fiscal year ending in June of that year (June 1981). All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=A$0.87 (1979), A$0.89 (1980), A$0.88 (1981 and subsequent years). Values for years through 1981 are expressed in current rather than constant dollars/prices; values for 1982 and subsequent years are expressed in 1981 constant dollars/prices.

Table 2.—Australia: Imports of computers and peripheral equipment[1] by country of origin, 1980-82 and 1987

	1980		1981		1982		1987	
	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)	Value ($ millions)	Import market share (%)
Minicomputers								
United States	51.01	74.1	62.20	67.5	79.14	66.5	265.0	58.2
Japan	7.92	11.5	18.89	20.5	25.59	21.5		
United Kingdom	2.75	4.0	3.23	3.5	4.17	3.5		
France	1.38	2.0	1.38	1.5	1.79	1.5		
Germany	1.03	1.5	.92	1.0	1.19	1.0		
Other	4.75	6.9	5.53	6.0	7.12	6.0		
Subtotal	68.84	100.0	92.15	100.0	119.00	100.0	455.0	100.0
Small, medium, and large computer systems								
United States	104.38	49.6	124.08	46.2	145.60	45.5	340.0	45.3
Japan	45.24	21.5	65.77	24.5	84.80	26.5		
United Kingdom	16.84	8.0	21.48	8.0	25.60	8.0		
France	6.31	3.0	8.05	3.0	9.60	3.0		
Germany	4.21	2.0	4.03	1.5	3.20	1.0		
Other	33.46	15.9	45.03	16.8	51.20	16.0		
Subtotal	210.44	100.0	268.44	100.0	320.00	100.0	750.0	100.0
Peripherals (imported separately)[2]								
United States	41.98	68.0	52.96	67.4	67.67	67.0	235.0	64.4
Japan	1.06	1.7	4.32	5.5	7.58	7.5		
France	4.63	7.5	5.11	6.5	6.06	6.0		
United Kingdom	2.78	4.5	3.93	5.0	5.55	5.5		
Germany	1.54	2.5	1.96	2.5	2.53	2.5		
Other	9.77	15.8	10.30	13.1	11.61	11.5		
Subtotal	61.76	100.0	78.58	100.0	101.00	100.0	365.0	100.0
Data communications equipment (imported separately)[2]								
United States	5.33	44.9	7.17	51.6	8.25	55.0	25.0	65.8
Germany	2.43	20.5	2.85	20.5	3.23	21.5		
United Kingdom	1.43	12.0	1.67	12.0	1.73	11.5		
Japan	.89	7.5	.97	7.0	1.05	7.0		
France	.36	3.0	.35	2.5	.30	2.0		
Other	1.43	12.1	.89	6.4	.44	3.0		
Subtotal	11.87	100.0	13.90	100.0	15.00	100.0	38.0	100.0
Total imports	352.91		453.07		555.00		1,608.0	
Total imports from U.S.	202.70		246.41		300.66		865.0	
U.S. share of total imports		57.4		54.4		54.2		53.8

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[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

[2] Excluding equipment imported as components of integrated computer systems.

Source: See source notation of table 1.

made by manufacturers other than mainframers. Users are flocking to these add-on devices because they are low-priced and because they make it possible to upgrade an existing minicomputer rather than move up to a more expensive mainframe. Demand for a wide range of versatile peripherals is expected to propel the market at a 29 percent annual rate to $415 million in 1987.

Sales of data communications equipment have been seriously hampered in the past by the high cost and poor service offered by Australia's public telecommunications network. However, industry sources say that the significant improvements and more realistic rate structure planned for the end of 1982 should trigger a dramatic increase in the market for data communications equipment. From $29 million in 1982, sales are forecast to expand at a 19 percent rate to $70 million by 1987.

Market growth for small, medium, and large computer systems, forecast at about 19 percent per

Table 3.—Australia: Population of computers, by size,[1] 1981 and 1987

	1981		1987	
	Number of units	Percent of total	Number of units	Percent of total
Minicomputers	7,100	68.9	24,000	81.3
Small computers	2,100	20.4	4,000	13.6
Medium computers	600	5.8	800	2.7
Large computers	500	4.9	700	2.4
Total	10,300	100.0	29,500	100.0

[1] Computer size is based on the following examples of IBM processors and includes the equivalent processors of other manufacturers: minicomputers, IBM Series 1 and Systems 23, 34, 5110, and 8,100; small computers, IBM System 38; medium computers, IBM 4331 and 4341; and large computers, IBM 3031, 3032, 3033, and 3081K.

Source: "Report on Computers in Australia: Part Two, Quantitative Assessments," Foundation for Australian Resources, May 1980, and trade source estimates and projections.

annum, largely hinges on the evolution of distributed processing in Australia. Improvements in data communications facilities are certain to make networked mini's more popular. Even so, industry observers expect security considerations to sustain the demand for centralized processing and larger mainframes. The population of small mainframes is expected to rise from 2,100 in 1981 to some 4,000 by 1987, intended primarily for business applications. Upgrading from currently installed small systems is expected to add 200 units to the number of medium-sized computers, raising the population in this category from 600 in 1981 to 800 in 1987. Large computer sytems are expected to number 700 by 1987, up from 500 in 1981.

Manufacturing sector is the largest EDP user.—Manufacturing concerns made 21.5 percent of computer equipment purchases in 1981 (see table 4). Although the sector currently accounts for nearly a quarter of the country's installed computer base by value (see table 5), the degree of computerization in Australian factories remains relatively low. Continued upward pressure on wages and union demands for a 35-hour week are, however, expected to spur many plant managers into automating both administrative functions and actual manufacturing processes. Twenty-five percent per annum growth is foreseen in the sector's purchases through 1987.

Government agencies plan system expansion.—In the government sector, Australia's Commonwealth Public Service (CPS), the largest single user of computer hardware, is sharply stepping up its purchases to boost productivity in the face of staffing ceilings. Industry sources say that shifting the purchase decision for new EDP equipment acquisition procedures, from an Interdepartmental Committee to individual Department heads, should make selling to the Government easier. Major computer expansion plans have been announced by the Departments of Administrative Services, Business and Consumer Affairs, Defense, Housing and Construction, Social Security, Industry and Commerce, Veterans Affairs, and the Treasury. By 1987 government expenditure is forecast to account for 15 percent ($257 million) of computer hardware purchases.

Banking and insurance sectors are experienced users.—Less dramatic growth is foreseen in equipment spending by the country's financial institutions and insurance companies. Already two of the most extensively computerized sectors of the Australian economy, these buyers are expected to replace and upgrade existing facilities, not install new equipment. A number of banks are discussing mergers in anticipation of a Government ruling opening the domestic market to competition from foreign banks. Any financial institutions that merge are likely to curtail EDP expenditures until a single computer system can be selected. Insurance companies' future investment will be for extending data communications networks.

Broad range of equipment is sought by other sectors.—Above-average growth is anticipated for expenditures on computers and related equipment by the retail and wholesale, utility, communications, health care, and publishing and printing sectors. Retailers and wholesalers are likely to invest heavily in point-of-sale (POS) systems, credit verification systems, and key-to-disk or -diskette data entry devices to improve management control and customer service. Among the 140,000 small and medium-sized operations in this sector are many potential customers for mini's and small entry-level business comput-

Table 4.—Australia: Expenditures[1] for computers and peripheral equipment by major user sectors, 1981 and 1987

	1981		1987	
	Value ($ millions)	Percent total	Value ($ millions)	Percent total
Government	64.35	13.5	257.25	15.0
Manufacturing	102.48	21.5	394.45	23.0
Banking and finance	45.28	9.5	128.63	7.5
Insurance	36.23	7.6	94.32	5.5
Retailing and wholesaling	28.12	5.9	120.05	7.0
Transportation	30.98	6.5	102.90	6.0
Utilities	17.64	3.7	77.18	4.5
Communications	32.89	6.9	137.20	8.0
Health care	16.21	3.4	77.18	4.5
Education and research institutions	38.13	8.0	120.05	7.0
Publishing and printing	14.30	3.0	60.02	3.5
EDP service bureaus	28.60	6.0	77.17	4.5
Other	21.46	4.5	68.60	4.0
Total	476.67	100.0	1,715.00	100.0

[1] Excluding costs of software, hardware maintenance, sales commissions, etc.

Source: See source notation of table 1.

Table 5.—Australia: Cumulative number and value[1] of installed computers,[2] by major user sector, as of 30 June 1981

	Minicomputers		Small computers		Medium computers		Large computers	
	Number of units	Value ($ millions)	Number of units	Value ($ millions)	Number of units	Value ($ millions)	Number of units	Value ($ millions)
Government	1,450	101.2	337	60.2	86	50.2	98	228.3
Manufacturing	1,520	105.9	706	126.1	147	85.7	114	265.6
Banking and finance	155	10.8	120	21.4	53	30.8	71	165.4
Insurance	42	2.9	92	16.4	32	18.7	46	107.2
Retailing and wholesaling	178	12.4	105	18.7	25	14.6	14	32.8
Transportation	95	6.6	26	4.7	22	12.8	15	34.9
Utilities	110	7.7	76	13.6	18	10.5	14	32.6
Communications	735	51.2	35	6.3	5	2.9	10	23.3
Health care	195	13.6	45	8.0	6	3.6	6	13.9
Education and research institutions	1,240	86.5	95	16.8	30	17.5	49	114.2
Publishing and printing	210	14.6	63	11.3	8	4.7	5	11.6
EDP service bureaus	390	27.2	110	19.7	90	52.5	45	104.9
Other	780	54.4	290	51.8	78	45.5	13	30.3
Total	7,100	495.0	2,100	375.0	600	350.0	500	1,165.0

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

[2] Computer size is based on the following examples of IBM processors and includes the equivalent processors of other manufacturers: minicomputers, IBM Series 1 and Systems 23, 34, 5110, and 8,100; small computers, IBM System 38; medium computers, IBM 4331 and 4341; and large computers, IBM 3031, 3032, 3033, and 3081K.

Source: Rydge's EDP Manual 1981, Fourteenth Edition, and trade source estimates.

ers (see table 6). Significant expansion in electric power generation capacity is expected to create strong demand among utilities for process computers, mini-based distributed processing systems, and mass storage systems. The Australian Telecommunications Commission (ATC), also known as Telecom Australia, is the Government agency that controls domestic communications. The agency is foreseen buying switching, transmission, and network controllers to upgrade its facilities as well as intelligent terminals and stand-alone mini's to decentralize management of its 87,000-employee operation. The government-run health care sector is expected to turn increasingly to mini-based management and computerized information systems in order to raise productivity and hold down politically sensitive hospital costs. The printing and publishing industry also hopes to step up application of computer technology now that labor resistance to its introduction has been overcome.

Other established EDP users are unlikely to raise their purchases of computer hardware as steeply as first-time buyers. In the transportation sector, major airlines already employ sophisticated reservations and ticketing systems. However, significant sales growth is expected from retail travel agents as more agencies tap into those systems. Education and research institutions face funding restrictions that hamper their ability to purchase computers, and their share of the market is forecast to decline from 8 percent to 7 percent over the 1981-87 period. EDP service bureaus have lost much of their clientele to the inexpensive small business computer, but they foresee new opportunities in improved data transmission facilities. One of the largest service bureaus, ACI Computer Services, hopes to become a leader in data communications using satellites.

Major Market Trends

Computers of all sizes are used primarily for business and commercial applications in Australia (see tables 7, and 8). The importance of such applications increases with size; business use accounts for only 47 percent of mini installations, but for 63.5 percent of large computer processing time. Minicomputers are also popular for data communications (especially as terminal controllers) and industrial control (particularly of continuous processes). The proliferation of small and mini-based networks has stimulated a new demand for big central processing units (CPU's) to monitor and control data communications and teleprocessing. Data capture in the course of normal business transactions is spreading in Australia; the technique offers tremendous time and labor savings but places stiff demands on a CPU's ability to process large volumes of data quickly and accurately. Other facets of the market are discussed below.

Storage systems.—With the shift to smaller mainframes as hardware capabilities grow and prices fall, a primary market force in data storage is plug-compatibility. Australian users are finding it easy to expand the storage capacity of computer systems by adding on memories as their needs grow. High-density disk drives offer the obvious advantages of direct access and high capacity; removable drives provide the added flexibility of backing up data. Diskette drives continue to sell well because they provide an affordable means of storing and trans-

Table 6.—Australia: Total employment and number of establishments, by size,[1] in major EDP user sectors, June 1980

	Total employment	Number of establishments	Size of establishments
Government	1,640,500	1,208	The Federal Government, 6 State Governments, and approximately 1,200 local councils in towns and subdistricts.
Manufacturing	1,154,000	29,260	20,050 companies have less than 20 employees; 6,850 employ 20-99, and 2,360 employ 100 or more.
Banking and finance	308,900	666	321 banks have 20-99 employees; 345 employ 100 or more.
Insurance	70,100	300	NA
Retailing and wholesaling	1,062,400	148,828	106,650 retailers and wholesalers have less than 20 employees; 35,150 employ 20-99; and 7,028 employ 100 or more.
Transportation	259,100	24	4 companies are large (the 3 airlines and NSW railway), and 20 are medium-sized (the other railways and bus, courier, and road haulage companies).
Utilities	110,300	162	10 utility companies have less than 20 employees; 152 employ 100 or more.
Communications	108,200	54	3 companies are large (Australian Post and the government-operated authorities within the Australian Telecommunications Commission); there are 21 television stations and 30 radio stations.
Health care	364,100	1,100	NA
Education and research institutions	369,400	9,600	NA
Publishing and printing	101,100	2,334	1,600 companies have less than 20 employees, 534 employ 20-99; and 200 employ 100 or more.
EDP service bureaus	8,400	300	NA

Source: See source notation of table 1.

porting data even for the small user. Data storage on tape will generally be limited to backing up fixed-disk memories. External semiconductor memories should sell well due to their price competitiveness. The cost-effectiveness of these systems limits market prospects for magnetic bubble and extended core memories.

Data entry.—The advent of transaction-oriented processing in Australia has eliminated data entry as a separate function for many applications. Instead, data is captured directly during the transaction and used for inventory control, billing, and internal accounting purposes. When data input is done separately, large users prefer key-to-disk methods using cathode ray tube (CRT) terminals, while small users tend to employ key-to-diskette techniques. Keypunch data entry is declining fast, and key-to-tape equipment, though still widely used, is not expected to sell well in the future.

Integration of data entry into completion of a normal business transaction has broadened the market for specialized input techniques. OCR (optical character recognition) and OMR (optical mark recognition) input are popular where large amounts of data must be accurately entered. Typical end-users include the Australian Bureau of Statistics, off-track betting systems, large educational institutions, retail stores, and credit card companies. MICR (magnetic ink character recognition) input is standard for check processing by Australian banks.

Output.—Sales of high-speed non-impact printers are expected to grow faster than those of impact printers, especially as technological advances lead to lower prices and better performance for non-impact devices. Computer output on microfilm or microfiche (COM) hardware is expected to sell strongly for use in large installations typically employed by banks and insurance companies. Adoption of CAD on a larger scale by Australian industry is expected to boost sales of printer/plotters and graphic displays. As with written output, graphic displays are likely to be first presented on a CRT screen. In fact, CRT-equipped terminals represent one of the fastest growing of all output devices. The need to access a burgeoning number of data bases and the trend to on-line processing spur rapid growth in the market for CRT terminals.

Data communications.—While Telecom Australia controls domestic telecommunications services, the Overseas Telecommunications Commission (OTC) provides Australia's links with the rest of the world. Telecom Australia currently offers two types of data transmission service: Datel Exchange Lines provide speeds of up to 4,800 bits per second

Table 7.—Australia: Percentage breakdown of total installed minicomputers[1] by end-user applications, 1981

		Percent of total
Business/commercial data processing		47.0
Industrial control		14.5
Continuous process control	8.5	
Direct machine control	5.0	
Factory management	0.5	
Other	0.5	
Data communications		21.0
Terminal controllers	15.0	
Front end systems	3.5	
Message circuit switching	1.0	
Data concentrators	1.5	
Laboratory analysis		14.0
Medical sciences	5.5	
Other life sciences	4.0	
Physical sciences	4.5	
Other		3.5
Total		100.0

[1] Minicomputers include IBM Series 1 and Systems 23, 34, 5110, and 8,100 and equivalent processors of other manufacturers.

Source: See source notation of table 1.

(bps) over the public switched telephone network, and Datel Private Lines leased from Telecom Australia are capable of transmitting up to 9,800 bps on standard band and up to 48,000 bps using wideband. However, Telecom Australia expects to upgrade service and cut prices with two major improvements to the domestic telecommunications network.

Industry sources say that many users have complained about Telecom Australia's service and prices, in part because charges based on distance made data transmission between Australia's widely dispersed cities expensive.

By the end of 1982 it will make available AUSTPAC, a public packet switched service, and Digital Data Service (DDS), which will supplement and be plug-compatible with Datel service. AUSTPAC will allow Telecom Australia to base prices on volume rather than distance by offering packet switched service at up to 48,000 bps and providing better utilization of transmission lines, which will facilitate communication between diverse terminals, and ensure virtually error-free transfer of data.

DDS offering synchronous full duplex operation at 2,400 to 48,000 bps, is expected to provide better quality transmission, greater reliability, faster service, and more flexible system design. DDS will cut costs by combining transmission and multiplexing (thus reducing the need for customer-supplied multiplexing equipment) and by making tariffs less distance dependent. Charges are expected to be substantially lower than those of Datel, especially over inter-capital routes.

These major enhancements to the data communications network could dramatically step up the pace of decentralization in Australian computer use. Even without the new facilities, Telecom Australia officials report that the number of modems in operation grew from less than 20,000 in 1978 to over 35,000 in 1980. Analysts expect nearly 160,000 modems to be in operation by 1986, though the advent of DDS and AUSTPAC could push that figure even higher. In addition to providing modems, Telecom Australia must approve any item of computer equipment for use on the telecommunications network.

For international data telecommunications, OTC provides both circuit-switched datel service and packet-switched service through its Multimode International Data Acquisition Service (MIDAS). MIDAS connects to the TYMNET and TELENET network in the United States. The Federal Government has also given OTC responsibility for Domsat 1, Australia's first domestic communications satellite to be launched in 1985. However, the availability of data communications channels is still uncertain.

Distributed vs. centralized processing.—Centralized data processing still predominates in Australia, but local observers expect an accelerating switch to distributed processing as Telecom Australia offers better service and lower rates. A growing number of users have already decentralized. Manufacturers and utilities employ distributed processing for process control, banks and insurance companies link branch offices to a central computer, and travel

Table 8.—Australia: Percentage breakdown of total processing time of installed small, medium, and large computers[1] by end-user application, 1981

	Small computers	Medium computers	Large computers
Business/commercial data processing	54.0	61.0	63.5
Industrial automation/ process control	7.0	5.5	3.0
Scientific/engineering applications	5.5	3.5	2.5
Military/aerospace applications	2.5	2.0	4.0
Data communications/ teleprocessing	5.5	6.5	10.0
Medical/scientific lab analysis	5.0	5.0	5.0
Education, instruction	8.0	9.0	8.0
Other	12.5	7.5	4.0
Total	100.0	100.0	100.0

[1] Computer size is based on the following examples of IBM processors and includes the equivalent processors of other manufacturers: small computers, IBM System 38; medium computers, IBM 4331 and 4341; and large computers, IBM 3031, 3032, 3033, and 3081K.

Source: See source notation of table 1.

agents use intelligent terminals to disperse processing in the transportation sector. Telecom Australia itself is turning away from centralized processing in an effort to streamline its own management.

Networked vs. freestanding minicomputers.—Many firms use widely dispersed minicomputers to handle local accounting, entry, and inventory control. However, such mini's frequently operate more like stand-alone units than parts of a network. For example, the Norman Ross retail chain operates POS terminals in a number of distant stores in rural New South Wales and Queensland. Instead of sending data back to Sydney on-line, however, the individual stores print management and daily audit reports on their own printers and ship them to the home office via overnight courier. Such freestanding computers will likely be drawn into networks as data transmission services are strengthened.

Small business computers.—Since business and commercial applications dominate both minicomputer installations and small mainframe processing time, demand is clearly strong for small business computers. Trade sources estimate the current number of users is 4,500, but expect growth of up to 30 percent a year in sales as prices fall and the equipment becomes easier to use. Up to 100,000 firms have been identified as potential users of small business computers, though the availability of low-cost microcomputer systems may cut into growth at the lower end of the market. By 1987, forecasts indicate a small business computer population of approximately 15,000 units (excluding microcomputers).

U.S. companies dominate local sales of small business computer systems, but they face growing competition from Japanese—Nippon Electric Company (NEC), Mitsui, Mitsubishi, Panasonic—and European manufacturers—International Computers Limited (ICL) and Plessey of the U.K., Germany's Nixdorf and Triumph-Adler, Philips of the Netherlands, and Italy's Olivetti. Hundreds of suppliers are competing for a place in this market, and some industry analysts have been predicting a shakeout of smaller firms. However, as long as the Australian market continues its current spectacular growth, this appears unlikely in the next few years.

Automated transaction-oriented business information systems.—The trend to integrate computers into everyday transactions ranging from buying groceries to purchasing theater tickets is expected to generate rising demand for automated business transaction information systems. In the transportation industry, leading airlines make airline, hotel, car rental, and tour reservations and write tickets using an on-line system. Together, several prominent air carriers have developed the Multi-Access Agents Reservation System (MAARS), which routes requests from travel agents to the appropriate airline's reservation system. The MAARS system also incorporates flight inquiry facilities and can be used to construct itineraries and write tickets. Retail and wholesale establishments offer the largest market for automated business transactions systems. POS terminals operated by clerks have been installed in a number of retail department stores. The anticipated introduction of bar coding to Australian supermarkets is expected to stimulate brisk spending for transaction terminals with OCR capability.

Automated banking systems.—Financial institutions have been among the most active in computerizing their operations. Virtually all branches of major banks process their accounts by computer. Several banks, including the Australia and New Zealand Banking Group, the Bank of New South Wales, the National Bank of Australasia Limited (National), and the Commercial Banking Company have already converted to on-line operation of most banking services, and other major financial institutions are likely to follow. Terminals have been installed for staff use in most branches. Introduction of customer-operated automatic teller machines is proceeding smoothly. The Bank of New South Wales has installed about 75 of its "Handybanks" throughout Australia, while the Commonwealth Bank's "Autobank" (introduced at 59 locations in Sydney, Canberra, and Melbourne in 1981) offers cash advances on a consumer's bank credit card.

On-line electronic funds transfer has grown less dramatically. Instead, transactions are cleared through a Central Magnetic Tape Exchange (CEMTEX), where banks, insurance companies, Government agencies, and large corporations send computer tapes with transactions. CEMTEX gathers data from individual tapes, sorts it, and prepares a new tape on the results for each affected bank.

Software and data base management systems.—Trade sources estimate that Australian computer users spent $210 million on software (excluding costs of programs developed in-house) in 1981, about $60 million for systems software, and $150 million for applications software. Systems software is almost always supplied by the mainframe manufacturer, though some independent software houses successfully market data base management systems and programming utilities. Most end-users with large systems still develop applications programs in-house. But they are increasing their reliance on standard applications packages and software house offerings because the cost of custom-developing programs is so high. Both small and large firms often modify packaged programs to their individual requirements, an activity that is expected to occupy many in-house programmers in the future. By 1987, the market for systems software is projected at $150 million, while spending for applications software is forecast to reach $400 million.

Four programming languages (COBOL, RPG, FORTRAN, and BASIC) are used in most Australian computer applications. Banks, insurance companies, and Government organizations often employ data base management systems, including those supplied by IBM (DL1, IMS), Cincom Systems (TOTAL), Cullinane (IDMS), Software AG (ADABAS), Facom (AIM/DB), and Honeywell (DM IV). The IBM systems dominate among IBM users; TOTAL is often used on other mainframes. Other popular systems software packages include telecommunications monitors, file management systems, disk utilities, and sorting systems. Applications packages offered by major vendors cover virtually all phases of accounting, materials management, and business analysis.

EDP personnel.—The total number of EDP employees in Australia is estimated at 100,000, including some 30,000 programmers, systems analysts, EDP managers, and design engineers. While trained people are scarce throughout the user industries, shortfalls are especially acute in such specialized skills as data base management, data communications, CAD, and CAM. The inadequate supply of computer professionals has boosted salaries and raised turnover rates as companies vie for programming talent. Attractive salaries have also lured immigrants: the number of skilled computer personnel settling in Australia has risen from 358 in 1978 to 640 in 1981. Of the estimated 1,200 specialized workers added to the EDP professional pool each year through graduation from Australian colleges and universities, about 80 percent are available to work for business or government. The remainder will work for educational institutions or the military. Unfortunately, the number of graduates is expected to decline over the next several years. Shortages—of funds, qualified experienced teaching staff, and computer hardware for educational purposes—are forcing schools to restrict their offerings of computer courses.

Equipment acquisition.—Most Australian users lease their computers. Small firms do so to gain tax advantages and save working capital; larger companies share those goals, but also hope to avoid being saddled with purchased equipment when it becomes obsolete or inadequate. Users even lease the more expensive peripherals, though small individual items are usually bought. Lease financing is generally arranged through a third party. Large banks and government departments tend to buy equipment outright.

Local users have traditionally preferred to deal with a single vendor for convenience, technical and educational support, and fault correction. But as firms develop their own computer expertise, many will be shopping around to take advantage of sharply lower prices on compatible peripherals sold by independent vendors.

Competitive Environment

Foreign manufacturers, led by U.S. firms, dominate all segments of the market except data communications equipment, where domestic production far exceeds imports. In all, foreign vendors supply about 90 percent of the Australian market for computers and related equipment. Moreover, they also account for 75-80 percent of Australian exports; many of the multinational computer giants use Australia as a regional distribution center and ship substantial quantities of equipment to New Zealand and Papua New Guinea.

U.S. suppliers.—American vendors have established a solid user base in Australia, accounting for nearly 80 percent of the computer population by value in 1981 (see table 9). IBM alone had an installed base of over 2,500 mainframes with a total value of more than $800 million as of mid-1981. U.S. firms are recognized for their innovative hardware and software, and users generally appreciate American marketing and service support. Close attention to the special needs of the local market, such as flexible, easy-to-use applications packages and hardware configurations tailored to Australian conditions, could help buttress the strong U.S. position.

A large number of U.S. manufacturers are supplying a full range of EDP hardware to Australia. Among them are IBM, Burroughs, Honeywell, Univac, Control Data Corporation (CDC), Digital Equipment Corporation (DEC), and NCR. Minicomputers also come from Datapoint, Data 100, Perkin-Elmer, Texas Instruments, and Wang. Australian factories are equipped with computerized process controls made by Honeywell, Bailey Control, Fox-

Table 9.—Australia: Cumulative number and value[1] of installed computers, by major suppliers, as of 30 June 1981

	Number of units	Value ($ millions)	Share of total value (%)
IBM	2,560	808	33.9
Burroughs	440	250	10.5
Honeywell	1,230	241	10.1
ICL (UK)	1,150	203	8.5
Univac	365	198	8.3
Fujitsu/Hitachi, NEC/Toshiba Mitsubishi/Oki (Japan)	250	176	7.4
CDC	300	136	5.7
DEC	1,500	105	4.4
NCR	1,050	91	3.8
CII-HB (France)	110	48	2.0
Siemens (Germany)	400	5	0.2
Others	945	124	5.2
Total	10,300	2,385	100.0

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[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

Source: Rydge's EDP Manual 1981, Fourteenth Edition, and "Report on Computers in Australia: Part Two, Quantitative Assessments," Foundation for Australian Resources, May 1980.

boro, and Leeds & Northrup. Memorex provides a variety of storage devices and data communications equipment, while Tektronix competes successfully with its graphics terminals and plotters.

Under intense competitive pressure from third-country rivals, the U.S. share of imports is forecast to decline from its 1980 level of 57 percent to about 54 percent in 1987. Nonetheless, swift increases are anticipated in U.S. sales of all major categories of equipment. American suppliers are forecast to account for nearly two-thirds of imported peripherals and data communications equipment in 1987. Industry sources predict excellent sales prospects for peripheral storage devices (magnetic disk and diskette drives, semiconductor memories), data entry equipment (key-to-disk or -diskette, OCR equipment), output devices (plotters, impact and non-impact printers, CRT displays), terminals, and peripheral controllers and interface devices. Salable data communications equipment includes communications processors, modems, acoustic couplers, multiplexors, and concentrators.

In the market for minicomputers, U.S. sales are forecast to rise 27 percent a year despite growing rivalry from Japanese firms. Slower expansion is foreseen in demand for American-built small, medium, and large computer systems, though small and large general purpose mainframes are considered highly salable.

Domestic suppliers.—About 16 Australian companies employed an estimated 600 workers to manufacture and assemble computers and related equipment in 1981, producing hardware valued at $51.3 million. Data communications equipment currently accounts for the largest share (43 percent in 1981) of local production, but ambitious expansion is slated for the manufacture of minicomputers and peripherals. By 1987, mini's and peripherals are projected to account for two-thirds of Australia's $197 million output. The largest local competitors include Amalgamated Wireless Australasia (AWA) and Hartley Computer Applications. AWA manufactures data communications equipment, CRT display terminals, and other peripherals, while Hartley specializes in mini-based small business systems.

Several subsidiaries of U.S. and third-country vendors also manufacture here. Standard Telephones and Cables (ITT, U.S.) makes data communications equipment and peripherals; Philips manufactures data transmission equipment and assembles minicomputers; Racal (U.K.) builds data communications equipment; and EMI (U.K.) manufactures minicomputers for specialized military applications. Raytheon International Data Systems (U.S.) recently announced plans to manufacture much of the Raytheon data processing product line in Adelaide, South Australia.

In addition to providing 24 percent tariff protection for CRT display terminals and a 6 percent levy on other computer hardware, the Australian Government has since 1977 assisted local vendors with an Automatic Data Processing Equipment Bounty. The Bounty, which applies to all computers and related equipment other than CRT displays, pays domestic manufacturers a percentage of local value added (declining from 20 percent to 7.5 percent) for the first 7 years of production. Neither the tariff nor the Bounty has significantly hindered imports.

The domestic industry's R&D efforts currently focus on basic design of very large scale integrated (VLSI) chips. With an initial funding of $1.7 million, the Commonwealth Scientific and Industrial Research Organization (CSIRO) hopes to build an international reputation in VLSI design and applied microsystem architecture. VLSI chips will be designed at CSIRO's R&D installation in Adelaide, but built at factories elsewhere in Australia and overseas using close to state-of-the-art technology.

Third-country suppliers.—Japanese manufacturers represent the strongest threat to U.S. dominance in the Australian market. From $55 million in 1980, their sales have doubled to an estimated $119 million (21 percent of total imports) in 1982. Japan's Fujitsu, selling through its local Facom subsidiary, is challenging IBM and Honeywell for a share of the large computer market. Led by NEC Information Systems, Japanese vendors are also making inroads in the minicomputer market.

British suppliers account for about 7 percent of imports. U.K.-built hardware comes largely from ICL, which has provided an estimated 8.5 percent of the value of the current Australian computer base. ICL recently agreed to market some of Fujitsu's large computer equipment, and the U.K. firm's access to Fujitsu's advanced technology may enhance Britain's position in the future. Among other U.K. suppliers, Plessey markets minicomputers and peripherals.

Other third-country sources capture only modest shares of selected markets. Olivetti specializes in banking terminals and small accounting systems, Nixdorf does well with small to medium-sized computers, and Philips succeeds with minicomputers, terminals, and peripherals for business applications. Siemen's and Honeywell's French partner, CII-HB, also maintains small market shares.

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Laboratory Instruments

Australia

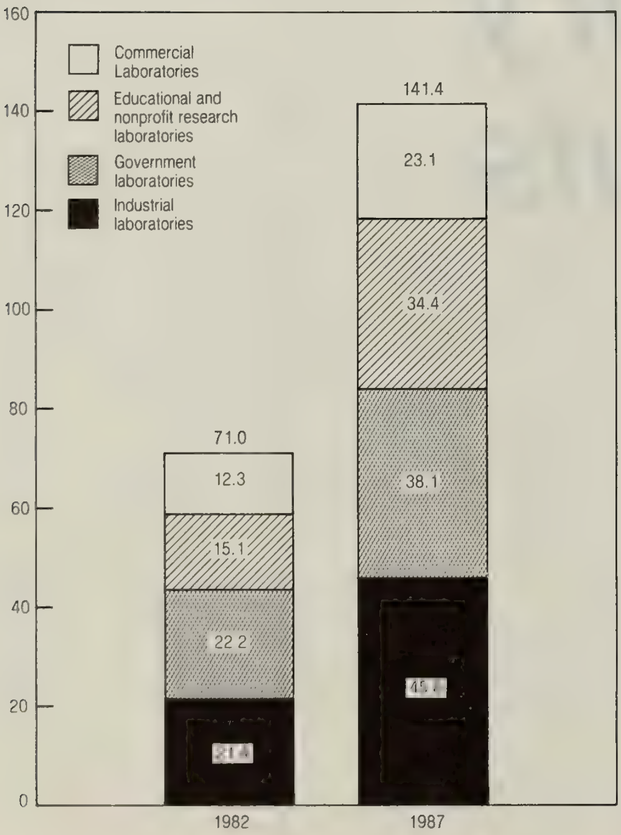
U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Australia's tremendous investment in its mineral resources has been slowed by stagnation in global commodities markets, but planners are going through with a still hefty $37 billion[1] worth of resource development and related projects. The market for laboratory instruments, aided by this broad economic stimulus, should roughly double in 5 years. Instrument sales are projected to top $141 million in 1987, up from an estimated $71 million in 1982 (see table 1 and figure). Imports should continue to satisfy most of Australia's demand, having supplied 85 to 90 percent of the market for the past several years. Strong technical and service performance is expected to keep American firms in the lead. Trade sources project U.S. sales to grow from $30.4 million to nearly $62 million in 1987 (see table 2).

Government laboratories and those run by educational institutions and nonprofit scientific research organizations are Australia's largest instrument markets. Although some trade sources predict conservative growth in their future instrument purchases, these two sectors combined will probably account for 50 percent of estimated 1982 purchases. For industrial instrument buyers, trade sources say chemical industry turnover will nearly triple by 1987, and it should remain Australia's largest industrial instrument buyer. More stringent government quality control regulations could force the important food industry to raise expenditures for laboratory testing and research. The primary metals industry is the source of almost daily reports of new mineral fields to add to Australia's already rich deposits of uranium, coal, bauxite, copper, zinc, and aluminum.

Australia: The market for laboratory instruments, 1982 and projected 1987

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research report; values based on Australian trade source estimates.

Table 1.—Australia: Size of market for laboratory instruments 1980, 1982, and projected 1987

(in millions of U.S. dollars)

	1980	1982	1987
Production	20.4	31.0	90.8
Imports	15.1	67.6	135.9
Exports	18.0	27.6	85.3
Market size[1]	53.5	71.0	141.4

[1] Market size equals production plus imports minus exports.
Source: Values based on Australian trade source estimates.

Competitive Environment

Though importers will face stiffer competition from local manufacturers in some fields, most instruments made domestically are exported. Some Australian atomic absorption spectrophotometers, pH meters, and gas chromatographs have world-class reputations and account for most of the country's sales abroad. About half of all instrument imports come from the United States. The remainder are mostly from Japan and Germany. Total import sales are expected to grow 15 percent a year from an estimated $67.6 million in 1982 to $136 million in 1987.

U.S. suppliers.—Trade sources expect American manufacturers to maintain their large market share through 1987. In addition to the quality of the instruments themselves, Australian lab managers appreciate the superior services offered by U.S. firms, as well as the availability of spare parts and consumables. Many American instruments are popular because they combine several functions through automation, making them very easy to use. And for specialized uses, such as microbiological applications using chromatography, U.S. manufacturers are often the only sources of appropriate equipment for the Australian buyer.

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[1] All statistics in this Brief are based on the Australian fiscal year (July-June); the year referred to (e.g., 1980) is the fiscal year ending in June of that year (June 1980). All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=A$1.15 (1980) and A$.98 (1982 and subsequent years). Values through 1982 are expressed in current rather than constant dollars: values for 1983 and subsequent years are expressed in 1982 constant dollars.

A number of American companies are active in the Australian market. Perkin-Elmer and Varian Associates supply all the major sectors, and the latter operates a manufacturing subsidiary, Varian-Techtron, in Victoria. Hewlett-Packard is particularly successful in the food products sector. Government labs buy instruments from Packard Instruments as well as Varian and Perkin-Elmer.

Third-country suppliers.—Great Britain and the Scandinavian countries are important European instrument suppliers. German optics and spectroscopics are highly favored by Australians.

The Japanese have penetrated the lower-priced end of many instrument markets, offering low-cost durable equipment at very favorable terms. Local import agents say that Japanese firms provide ample information on their products and are making inroads among cost-conscious government laboratories and profit-oriented industrial laboratories. They speculate that Japan will eventually be competing in the entire range of instrument categories.

Domestic suppliers. — Australia's 122 domestic manufacturers produced laboratory instruments worth about $31 million in 1982. Nearly $28 million of that was exported. The top 15 companies, which produced half the total, include Medtel, Ausonics, Paton Industries, Scientific Glass Engineering, and the U.S.-owned Varian-Techtron.

Australian firms have built reputations on good design, service, and price competitiveness. Most of them are small and highly specialized, manufacturing a narrow range of equipment. Some have been quite successful.

Activon Scientific Products in Sydney, for example, was formed in 1976 to sell electrodes and cathode lamps. A year later it began making its own pH meters. Its product line now includes U.S.-made high-pressure liquid chromatographs (HPLC's) and a full range of accessories by such manufacturers as Whatman, Valco Instruments, Upchurch, Brownlee, and Rheodyne. Ativon also sells Omniscribe recorders made by Houston Instrument, another American firm.

Local instrument exports are encouraged by the government, explaining, in part, why such a high proportion of Australian product is sold abroad. Export companies receive subsidies from a special government grants program. Research and development spending is tax deductible, and there are special, stepped-up depreciation schedules for buildings and plant devoted to scientific research.

Table 2.—Australia: Imports of selected laboratory instruments 1980, 1982, and projected 1987

(in millions of U.S. dollars)

	1980	1982	1987
United States	24.5	30.4	61.6
Japan	7.6	12.2	31.2
Germany	4.6	6.0	12.2
Others	14.4	19.0	30.9
Total	51.1	67.6	135.9

Source: Data from the Australian Scientific Industry Association and trade source interviews.

Selected Instrument Markets

Both gas and liquid **chromatographs** are sales leaders in Australia (see table 3). Over $7 million worth are expected to be sold during 1982 and sales are expected to reach nearly $15 million by 1987—a 15 percent annual growth rate. Having broader uses in Australia than gas chromatographs, popular American-made HPLC's should show the fastest growth. Since the last boom in sales was in the late 1970's, analysts expect that the replacement market will also spur continued sales growth. New environmental standards also wil stimulate sales as chromatography takes on a wider role in assessing water quality.

The lower priced end of this market (under $5,000) is dominated by the Japanese supplier Shimadzu, which makes substantial sales to universities and colleges. Waters Associates (U.S.) has the largest share of the HPLC market with stiff competition from Foxboro (U.S.), Packard Instruments, and Pye-Unicam, the British firm owned by Philips (Netherlands). Varian holds the largest market share for gas chromatographs. Although Perkin-Elmer and Packard are close behind, local production is expected to replace some imports in future years.

The market for **spectrometers** is far less competitive. Since spectrometers are very complex and expensive to service, fewer firms want to make them. Sales in Australia are expected to increase 10 percent a year to about $15 million by 1987. Only a small number of spectrometers are made locally.

Leading American companies active in the market include Finnigan and Bruker. Bruker sells U.S.-made equipment while Finnigan, which bought Varian's spectrometry operation in 1981, sells instruments made in both the U.S. and Germany. X-ray spectrometers come from Bausch & Lomb (U.S.), Diano (U.S.), and Rigaku (Japan). Mass spectromers are sold by Oxford Instruments (U.K.), and infrared instruments are sold by Foxboro.

Spectrophotometer sales constitute the largest instrument market in Australia in terms of aggregate sales. By 1987, annual sales may top $23 million, a 15 percent a year growth rate on estimated sales of nearly $12 million in 1982. The market is highly competitive with a number of active companies. Perkin-Elmer, Beckman, and Instrumentation Laboratories are prominent American suppliers. Pye-Unicam is also successful.

Australian instrument makers compete well in this market, enjoying increasing demand for their atomic absorption spectrophotometers. Production data indicate local output will be chiefly at the lower priced end of the market. Varian-Techtron and Scientific Glass Engineering are succeeding by specializing in single-beam instruments selling at under $10,000. Australian technology is considered sound—the flame ionization detector was invented here—and 80 percent of local production is currently exported. The German Eppendorf flame spectrophotometer and the Ukivon from Kontron (Switzerland) are also popular.

Inductively coupled plasma spectrophotometers will be in greater demand for use in screening samples for wide ranges of mineral content. Atomic absorption instruments also have a good future in natural resource exploration.

The chief buyers of **analyzers** in Australia are hospitals and pathology laboratories. Sales are projected to grow by a modest 5 percent a year to just over $5 million during 1987. The rapid technological change affecting these devices will make the replacement market most important. Thermal analyzers, often used for raw materials analysis, should be an expanding market; Perkin-Elmer instruments are popular. Micromeritics (U.S.), Beckman, Townson & Mercer (U.K.), and Radiometer (Denmark) are prominent suppliers.

Sales of **photometers** should reach almost $4 million in 1982 and are expected to rise 10 percent a year through 1987 to about $6 million. This market, too, is highly competitive. Varian is the top supplier of atomic absorption photometers. Townson & Mercer is the chief flame photometer supplier, a market in which about 150 units are currently sold each year.

Growth averaging 12 percent a year is projected for purchases of **pH meters,** leading to sales of $1.4 million in 1987. Local manufacturers supply 80 percent of demand. Their products have wide consumer acceptance and a significant cost advantage (based in part on federal tariff protection). In addition to Activon, TPS has a strong position, specializing in electrochemical meters. LKB of Sweden is the most prominent importer.

Smaller increases, 4 to 5 percent per annum, are projected in the markets for **densitometers, refractometers,** and **calorimeters** in Australia. Densitometer sales in 1987 are projected at $1.7 million. Lab managers are also expected to spend $1.6 million on refractometers and $130,000 on calorimeters.

Table 3.—Australia: Sales of selected laboratory instruments, estimated 1982 and projected 1987

(in thousands of U.S. dollars)

	1982	1987
Chromatographs	7,400	14,800
Spectrometers	9,000	14,500
Spectrophotometers	11,500	23,100
Analyzers	4,000	5,100
Photometers	3,700	5,900
Densitometers	1,300	1,700
pH meters	800	1,400
Refractometers	1,300	1,600
Calorimeters	100	130

Source: Values based on Australian trade source estimates.

Major Purchasers

The Federal Government is the largest source of research and development funds. Though current official figures are unavailable, government agencies spent $587 million on R&D in 1977. State governments provided $136 million that year, and industry about $171 million. Observers say that a decline in overall spending levels in recent years is causing some concern. Besides shrinking in volume, fewer R&D dollars are being directed toward highly experimental work. And the trend toward foreign acquisition of Australian firms often moves R&D efforts to the laboratories of parent companies overseas, leaving local facilities with routine work such as product testing.

These concerns have not halted growth in laboratory budgets, however. Overall expenditures are still expected to increase at a 14 percent annual rate, approaching $400 million in 1987 (see table 4). Industrial budgets will account for 30.8 percent of that total, government agencies 28 percent, and educational and nonprofit research laboratories 24.9 percent. More than a third of nationwide expenditures are earmarked for instrument purchases.

The sector offering greatest opportunities to instrument manufacturers is likely to be educational and other nonprofit scientific research institutions. Their instrument spending is projected to expand nearly 18 percent a year, to $34 million in 1987. The central government is becoming increasingly cost-conscious and plans to hold spending growth to about 11 percent. Nevertheless, federal agencies are expected to represent a $38 million market in 1987.

Among industrial laboratories, fastest sales increases are predicted for the petroleum industry and the oil and gas extraction industry. Annual growth of 22 percent is projected for both, bringing 1987 instrument spending to $4.8 million and $3.3 million, respectively. Other industries with major instrument acquisition plans are chemicals ($7.9 million in 1987), food products ($4.8 million), and primary metals ($4.7 million).

The activities of laboratories in the government, food products, and chemicals industries are profiled below. The original research from which this Brief is drawn includes more detailed descriptions of specific R&D fields of greatest interest to Australian scientists (see Additional Information box).

Government laboratories.—The bulk of government R&D spending goes to three federal laboratories: the Commonwealth Scientific and Industrial Research Organization (CSIRO), the Defense Department, and the Atomic Energy Commission (AEC). Virtually all the research conducted by federal laboratories is funded by the government.

CSIRO had a budget of $320 million for fiscal 1981/82, of which $56 million was earmarked for major capital projects. It is the largest research organization in the country, employing over 6,800. CSIRO's mission is to conduct a program of strategic applied scientific research, including collaborative, commissioned, and other kinds of joint projects with government agencies and industries. It is comprised of five institutes (Animal and Food Sciences, Biological Resources, Earth Resources, Industrial Technology, and Physical Sciences) and a Bureau of Scientific Services. Among the expansion plans under its jurisdiction is the new Australian National Animal Health Laboratory at Geelong that will cost $121 million when completed. Initial outlays for a new materials science laboratory at Clayton will account for about $10 million of the year's capital investments. Work has also begun on an oceanographic research ship, buildings, and other activities associated with the transfer of the Division of Fisheries and Oceanography to Tasmania at an eventual cost of $29 million. A new $12 million laboratory complex for marine research has been approved by the government, and construction at Hobart, Tasmania, should begin in 1982. It will be run by the Divisions of Fisheries Research and Oceanography.

The AEC's research areas include uranium processing, atomic energy, and the production of radioisotopes. Its $32 million budget for 1982 is intended to maintain the commission's past level of activity.

Australia's Defense Department is expected to spend $144 million on weapons science and technology in 1982. Considerable attention will be devoted to development of the Jindalee over-the-horizon radar, underwater detection aids, and electronic warfare techniques. Spending increases for laboratory instruments should keep pace with inflation, but none are expected beyond that.

Food products industry laboratories.—The food products industry is a major component of the Australian ecnomy. In 1979, industry sales topped $12 billion. As a whole, food products makers spent

Table 4.—Australia: Laboratory expenditur by major end-users, estimated 1982 and projected 1987

(in millions of U.S. dollars)

	Number of laboratories	Laboratory 1982	expenditures 1987	Purchases of laboratory instruments 1982	1987
Government	430	63.5	108.8	22.2	38.1
Educational and nonprofit institutions	380	50.4	98.2	15.1	34.4
Independent commercial laboratories	370	35.1	66.0	12.3	23.1
Industry					
Oil and gas extraction	30	3.5	9.3	1.2	3.3
Food products	280	7.1	13.8	2.5	4.8
Chemicals	450	9.6	22.6	3.4	7.9
Petroleum	70	5.2	13.8	1.8	4.8
Rubber and plastic products	50	1.8	4.0	.5	1.2
Stone, clay, and glass	120	3.5	6.8	1.2	2.4
Primary metals	200	6.9	13.5	2.4	4.7
Fabricated metal products	60	3.9	8.6	1.4	3.0
Transportation	80	3.3	5.7	1.2	2.0
Instruments	85	1.8	4.8	.6	1.4
Other[1]	30	10.5	18.5	5.2	10.3
Total	2635	206.1	394.4	71.0	141.4

[1] "Other" includes pharmaceuticals, paints, and miscellaneous industries.

Source: Australian trade source estimates.

nearly $400 million on capital projects, a figure that is expected to swell to $550 million by 1987.

Forced by more stringent government regulations to improve quality control, Australian food producers will probably have to spend more on laboratory R&D over the next few years. The dairy sector, for example, is expected to enhance its compliance with stricter health regulations, and the meat industry will be spending more on quality control.

Data on this industry's laboratory activities are somewhat sketchy. There are about 280 laboratories industry-wide, and estimates indicate that only a very small proportion of these have significant resources. About 40 to 50 percent of the industry's instrument purchases are made by the larger laboratories. The research division of C.S.R. undertakes research and analysis of sugar, alcohol, and flavor chemistry. The Mauri Brothers and Thompson Research Laboratories specialize in new product development, processing techniques, and biological testing. The Kraft Foods Research and Development Laboratory focuses on protein and flavor chemistry. And the Reckitt and Colman Foods Laboratory works on quality control on a range of processed food items.

Chemical industry laboratories.—This industry's total sales in 1979 were $4.7 billion. Estimates show that by 1987, turnover could leap to $12 billion, with capital expenditures of $400 million. Of an estimated 450 laboratories, 80 percent are relatively small and without large budgets or sophisticated equipment. Industry instrument purchases are estimated at $3.4 million in 1982, with sales growth projected at 18 percent over the next 5 years.

One of the largest facilities in the industry is the Imperial Chemical Industries Research Laboratories, which undertakes R&D in organic and inorganic chemicals and plastics. Roche Products conducts a range of research, including quality control, vitamin analysis, and biochemical and microbiological analysis, often on contract to major local pharmaceuticals manufacturerers. The Roche-Marine Pharmacology Research Establishment specializes in marine pharmacology research. Shell Chemical (Australia) has a laboratory in Sydney which tests and evaluates petrochemical products. Union Carbide Australia emphasizes quality control of fine chemicals, polyethylene resins, and dry cell batteries.

A proposal to build a $400 million chemical plant at Redcliff Point near Port Augusta is under consideration. Expected to produce caustic soda, chlorine, and ethylene dichloride, the facility is likely to need an R&D and test and evaluation laboratory.

Other industrial laboratories.—Analchem Consultants runs the largest privately owned laboratory in Australia. It conducts chemical and analytical testing of a wide range of products and materials. Amalgamated Wireless (Australia) performs communications and aviation research. Australian Paper Manufacturers has a laboratory that does chemical analysis and quality control for paper and cardboard products. Esso (Australia) conducts R&D and quality control analysis in the petroleum industry. The Broken Hill Proprietary Company undertakes major R&D projects in mining, oil and gas, and metallurgy, utilizing a broad range of laboratory instruments. Kodak (Australia) performs research and quality control to support its own photographic and ancillary equipment lines. Mount Isa Mines performs geological assays and quality determination studies for its mining operations.

Trade and Technical Regulations

Australia has no special technical standards for laboratory instruments; the country adheres to universal electrical safety standards and color coding of power cables.

Most instruments are permitted to enter Australia duty-free. However, there are several major exceptions. Spectrophotometers are levied at a rate of 15 percent; pH meters at a rate of 25 percent, and calorimeters, if connected to regulators, at a rate of 2 percent. Imports from certain members of the British Commonwealth are accorded a small reduction in these rates.

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Laboratory Instruments

Belgium

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

New government efforts to stimulate industrial investment and restore the Belgian economy to a growth path are expected to promote moderate but steady expansion in demand for laboratory instruments. The market should grow from $63 million[1] in 1980 to about $72 million in 1985, approximately a 3 percent average annual increase (see table 1 and figure 1). The economic recession that has been plaguing Belgium has resulted in some declines in industrial output. But the recovery expected to get underway in 1983 should encourage capital investment. Observers predict especially strong demand for advanced-technology goods that will help improve the cmpetitive position of Belgian industry. Automated laboratory instruments and systems, an American specialty, should enjoy particularly strong demand.

The industrial sector, the major user of laboratory instruments in Belgium, should continue to account for nearly 60 percent of the country's instrument sales through 1985 (see table 2). Industry's instrument outlays are forecast to rise from $34 million in 1979 to $42.5 million in 1985. Most such purchases are in connection with R&D activities, and total industrial laboratory expenditures are predicted to increase from $720 million in 1977 (the latest available data) to more than $1.2 billion in 1985. The chemicals industry is the largest industrial instrument purchaser, followed by the primary metals industry. Both are adopting systems approaches with data processing capabilities and will be looking for automated laboratory instruments that can be interfaced appropriately. The chemical industry's instrument purchases are expected to account for almost 20 percent of the market in 1985. The primary metals industry, including steel, iron, and nonferrous metals producers, is of major importance in the Belgian economy and is the target of modernization and streamlining efforts. This sector's 1985 instrument purchases are expected to come to 7 percent of the Belgian market.

Table 1.—Belgium: Size of market[1] for laboratory instruments 1979, 1980, and projected 1985

(in millions of U.S. dollars)

	1979	1980	1985
Production[2]	32.92	33.54	34.2
Imports	60.14	68.03	76.0
Exports[3]	35.13	38.53	38.3
Market size	57.93	63.04	71.9

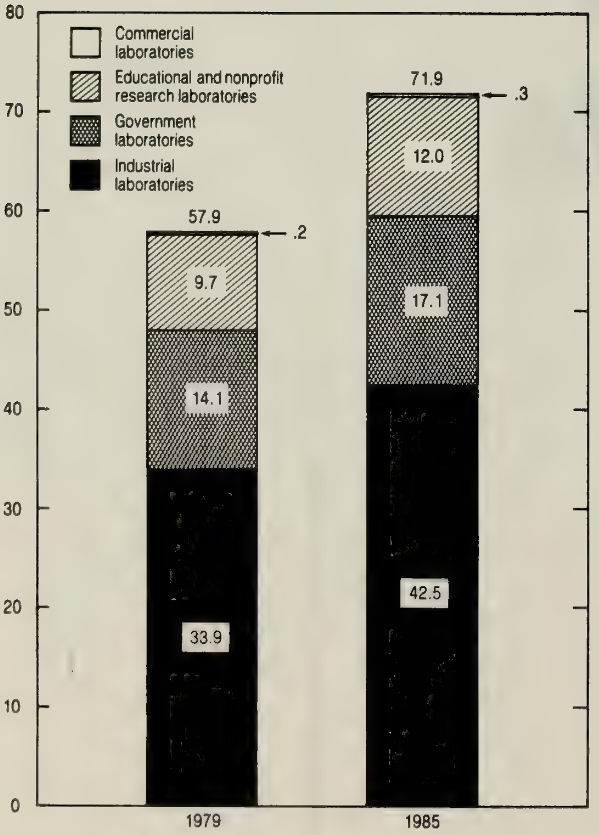
[1] Market size equals prduction plus imports minus exports.

[2] Domestic production figures include some OEM products consisting largely of imported components.

[3] Export figures include significant reexports.

Source: Belgian Ministry of Economic Affairs and official Belgian trade statistics.

Figure 1.—Belgium: The market for laboratory instruments, 1979 and projected 1985 (in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research report; values based on Belgian trade source estimates.

Most government laboratories are small, and many are testing rather than research facilities. However, the government does cooperate with industry in joint research efforts and research centers. Two such ventures, the Centre d'Etude de l'Energie Nucleaire (CEN) and the Institut National des Industries Extractives (INIEX), are being transformed from specialized centers into general facilities for applied research in their respective fields. This expansion should lead to increased instrument purchases in the nuclear and materials testing areas. Observers expect government laboratories to absorb a quarter of the 1985 instrument market.

Laboratories operated by educational and nonprofit institutions will continue to be significant instrument purchasers, with outlays roughly equalling those made by the chemical industry. Replacement needs and the Belgian government's interest in orienting universities toward more work with industrial applications should fuel instrument demand in this sector.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: U.S.$1=BF35.84 (1977), BF31.41 (1978), BF 29.31 (1979), and BF29.22 (1980 and subsequent years). Values through 1980 are expressed in current rather than constant dollars; values for 1981 and subsequent years are expressed in 1980 constant dollars.

Competitive Environment

Foreign manufacturers supply most of the Belgian laboratory instrument market and will continue to do so. Imports totaled $68 million in 1980 and are expected to increase 12 percent a year through 1985, reaching an annual level of $76 million. Trade sources estimate that 75 percent of domestic production is destined for markets outside Belgium, as well as about 25 percent of imports. Taking this into account, foreign instrument makers probably supply more than 80 percent of Belgian equipment needs. Germany is the leading foreign supplier, accounting for about one-third of the instrument import total. Output of the domestic laboratory instrument industry is concentrated in less sophisticated equipment primarily earmarked for the export trade (see table 3 for imports of selected laboratory instruments).

U.S. suppliers.—American instrument makers' sales in 1980, $7.2 million, represented about 11 percent of instrument imports. The 1985 U.S. share is pegged at 13 percent, totaling nearly $10 million. The United States is the second largest import source, and U.S. suppliers have been capturing sales at the expense of the German competition. American instruments enjoy a good reputation in Belgium, and many are regarded as standard in the academic and research communities. American marketing efforts are highly regarded, and spare parts availability and after-sales service are also considered good. The R&D facilities operated by U.S.-owned companies in Belgium provide both a market for American instruments and a showplace to familiarize Belgian users with what the United States has to offer. American-made electronic instruments have particularly favorable sales prospects, along with chromatographs, mass spectrometers, and equipment for the aerospace/avionics and nuclear industries.

American manufacturers active in the Belgian market include Hewlett-Packard, selling measuring equipment, voltmeters, spectrum analyzers, and chromatographs; and Tektronix, selling electronic test equipment. Varian Associates sells general measurement and information equipment. Packard Instrument supplies chromatography equipment, Bausch & Lomb is active in the market for spectrophotometers, and Technicon supplies chemical analysis instruments.

Third-country suppliers.—Instrument imports from third-country suppliers are projected to increase to $66 million in 1985 from an estimated $61 million in 1980. German suppliers had instrument sales approaching $23 million in 1980, more than 33 percent of the total. German manufacturers have been particularly successful in the past because of their active sales efforts in Belgium and the repu-

Table 2.—Belgium: Laboratory expenditures by major end-users, 1977 and projected 1985, and purchases of laboratory instruments, 1979 and projected 1985

(in millions of U.S dollars)

	Number of laboratories	Laboratory expenditures		Purchases of laboratory instruments	
		1977	1985	1979	1985
Government	100	104	206	14.1	17.1
Educational and nonprofit institutions	250	168	308	9.7	12.0
Independent commercial laboratories	NA	5	10	0.2	0.3
Industry					
Food products	5	15	27	0.9	1.0
Chemical	14	278	513	10.6	13.8
Petroleum	2	3	5	.1	.1
Rubber and plastic products	2	12	24	1.2	1.4
Stone, clay, and glass	1	30	55	1.8	2.2
Primary metals	6	60	96	3.9	4.9
Fabricated metal products	3	84	146	3.5	4.2
Transportation	1	28	51	1.0	1.2
Other	NA	210	308	10.9	13.7
Total	141	997	1,749	57.9	71.9

Source: Values based on official R&D statistics of the Organization for Economic Cooperation and Development (OECD) and trade source estimates.

tation of their products for reliability. However, their strengths have resided in the more classical, traditional instrumentation. The erosion in their market share (which went as high as 40 percent of the 1978 import total) can be attributed in part to the more technologically advanced equipment available from U.S. suppliers. Major German importers are Siemens (chromatographs, computers, and measuring equipment); Carl Zeiss (spectrophotometers and microscopes); Bruker Analytische Messtechnik (nuclear magnetic resonance and electron spin resonance spectrometers); Eppendorf Geratebau Netheler & Hinz (chemical analyzers); Ernst Leitz (optical microscopes); Schott-Jenaer Glaswerk (laboratory glassware); Schenck (balances); and Sartorius (balances).

The Netherlands accounts for an apparently larger portion of imports into Belgium (16 percent in 1980) than is actually the case. Many Dutch instruments are reexported by Belgium, so the Netherlands' market share more nearly approaches that of France or the United Kingdom. Major imports include oscilloscopes, oscillographs, educational instruments, materials testing equipment, instruments for physical and chemical analysis, and various electrical and electronic instruments. Among the Dutch firms active in the Belgian market are Philips (spectrometers and spectrophotometers), Vitatron (densitometers and colorimeters) and Breda (chemical analyzers).

The French share of the instrument import total in 1980 was 8 percent. Principal imports are electronic measuring equipment (including parts and accessories), glassware, furnaces, and electronic microscopes. Schlumberger is one of the most active French firms, marketing flowmeters in Belgium.

The United Kingdom's import share was 7 percent in 1980. Principal products include physical, chemical, and gas analyzers, materials testing equipment, and electronic measuring apparatus. Active companies include the Philips subsidiary, Pye Unicam (chromatographs), Nuclear Enterprises (counters), and EIL (electrochemical analytical instruments).

Switzerland supplies precision balances, optical microscopes, and a variety of electronic devices and instruments. Swiss suppliers include Metrohm (pH meters), Wild (microscopes), and Mettler (balances).

Firms in Japan are not very active in the Belgian instrument market at present, although their market share has been increasing. The Japanese have had some difficulty in providing good after-sales service on complex equipment. However, they have made significant inroads with lower-cost microscopes (Olympus) and are expected to make future gains in the sales of optical instruments such as spectrophotometers and electron microscopes.

Domestic suppliers.—The output of Belgium's laboratory instrument industry was less than $34 million in 1980. The industry consists of three large foreign-owned firms (Bell Telephone, Philips, and Siemens) and about a dozen smaller companies. The range of instruments produced is narrow and concentrated at the lower end of the technological spectrum. Most domestic production is exported to third-world countries, particularly those in Africa where Belgium has traditionally had close ties.

The domestic industry should remain essentially static through 1985. According to trade sources, any significant growth would have to come from the establishment of subsidiaries by more foreign instrument manufacturers, an unlikely event in view of Belgium's high labor costs. The foreign-owned firms operating in Belgium recently pressured the Government for support, threatening to close their facilities unless they receive more public sector purchases. The domestic industry could reap a few benefits from government policies to encourage small businesses and industrial innovation to improve competitiveness.

Table 3.—Belgium: Imports of selected laboratory instruments, 1978-1980

(in thousands of U.S. dollars)

	1978	1979	1980
Centrifuges for laboratory use			
United States	409	1,304	1,691
Germany	638	794	610
Others	561	476	560
Total	1,608	2,574	2,861
Gas/smoke analyzers			
United States	117	228	318
Germany	530	509	530
Others	618	463	710
Total	1,265	1,200	1,558
Electronic instruments for materials testing			
United States	264	283	623
Germany	417	1,513	1,683
United Kingdom	217	476	470
Others	888	635	933
Total	1,786	2,907	3,709
Spectrophotometers and other electronic measuring apparatus for laboratory use			
United States	932	2,365	1,386
Germany	577	737	852
United Kingdom	557	467	652
Others	1,971	829	1,869
Total	4,037	4,398	4,759

Source: Values based on Monthly Bulletin of Foreign Trade of the Belgium-Luxembourg Economic Union.

The three major firms account for over 50 percent of the country's domestic instrument production, but none supplies more than half the market for any individual product. Belgian manufacturers meet 5 percent of the respective market demand for spectrometers, spectrophotometers, photometers, and analyzers; 10 percent of the market for counters and calorimeters; 15 percent of the market for laboratory balances; 20 percent of the market for microscopes; and 30 percent of the market for testing and inspection instruments laboratory apparatus, and educational instruments. No significant changes are expected in these percentages through 1985, ad Belgian producers have relatively little impact in most of these instrument categories.

Philips' Belgian subsidiary, MBLE, makes a variety of equipment, including stroboscopic tachometers, dielectric testing equipment, spectral analysis instruments, time distribution equipment, and other engineering and electrical laboratory apparatus. Siemens produces time distribution equipment and other electrical laboratory equipment in Belgium. Electrical laboratory equipment is also manufactured by Bell Telephone. Among Belgian-owned firms, Balteau manufactures dielectric testing equipment and electrical laboratory equipment. Barco Electronic produces general laboratory equipment, optical components, and precision engineering instruments. Contigea makes calorimeters and precision engineering equipment. Manufacture Belge de Gembloux produces laboratory heating equipment.

Selected instrument markets.—The estimated 1980 Belgian market for **chromatographs** was $8.2 million, with a projected increase to $9.6 million for 1985 (see table 4). More widespread adoption of new methods is expected to stimulate market expansion, and integration of existing chromatography techniques into computerized systems should continue. High-pressure liquid chromatography (HPLC) offers a fast growing market that is attracting an increasing number of suppliers. The market for these instruments is now larger than that for gas chromatography, which is still showing slow but steady growth. Purchasers of chromatography equipment, mainly from the chemical industry, often select components from several sources to design their own systems. Combined techniques such as gas chromatography/mass spectrometry and gas chromatography/Fourier transform infrared (IR), in which mass or IR spectra are determined following chromatographic separation, are being used more often, particularly in the food and pharmaceutical industries.

Almost the entire market for chromatography equipment is supplied by foreign manufacturers, led by German firms, Siemens in particular. Philips also supplies the market through its Pye Unicam partner in the United Kingdom. The U.S. share is about 15

Table 4.—Belgium: Sales of selected laboratory instruments, estimated 1980 and projected 1985

(in thousands of U.S. dollars)

	1980				1985			
	Total	U.S.	Other foreign	Domestic	Total	U.S.	Other foreign	Domestic
Chromatographs	8,200	1,230	6,970	—	9,600	1,920	7,680	—
Spectrometers and spectrophotometers	6,150	1,538	4,305	307	6,850	2,055	4,452	343
Analyzers	4,500	675	3,600	225	5,150	1,030	3,863	257
Photometers	170	26	136	8	170	26	136	8
Densitometers	170	17	153	—	170	17	153	—
pH meters	1,525	76	1,449	—	1,650	83	1,567	—
Refractometers	1,860	93	1,767	—	2,100	105	1,995	—
Counters	3,100	775	2,015	310	4,100	1,025	2,665	410
Calorimeters	1,540	77	1,309	154	1,700	85	1,445	170
Hygrometers	170	—	170	—	170	—	170	—
Microscopes	8,900	712	6,408	1,780	10,250	1,025	7,688	1,537
Laboratory balances	3,080	—	2,618	462	3,450	173	2,760	517
Electrophoresis apparatus	3,080	308	2,772	—	3,450	345	3,105	—
Centrifuges/ultracentrifuges	3,080	1,540	1,540	—	3,450	1,725	1,725	—
Test and inspection instruments	3,250	163	2,112	975	4,100	205	3,075	820
Surface analysis systems	170	17	153	—	340	51	289	—
Electrodes	70	—	70	—	70	—	70	—
Laboratory apparatus	9,575	—	6,702	2,873	10,300	—	7,210	3,090
Educational instruments	4,450	—	3,115	1,335	4,800	—	3,360	1,440

Source: Values based on Belgian trade source estimates.

percent, and Hewlett-Packard is the best known American supplier.

The market for **spectrometers** and **spectrophotometers** is estimated at approximately $6.2 million in 1980 with an increase to over $6.8 million expected in 1985. Within this istrument category, demand should be particularly noteworthy for computer-controlled systems among industrial users and the universities that are moving toward a more industrial orientation. Automated nuclear-magnetic resonance (NMR) systems are expected to enjoy brisk demand in the chemical industry, along with IR spectrophotometers. The chemical industry is likely to make more frequent purchases of completely automated spectrophotometers as well as processors for incorporation into existing systems. Use of spectrophotometry is increasing in the food industry, and atomic absorption spectrophotometers, especially those incorporating flame emission, will be marketable in several industries, particularly primary metals.

The United States supplies 25 percent and other importers 70 percent of the Belgian market for spectrometers and spectrophotometers. The Netherlands' Philips is a principal supplier of X-ray and emission spectrometers. Among U.S. firms, Varian is noted for a range of spectrometers, including NMR and electron spin resonance (ESR), and Hewlett-Packard for mass spectrometers. Bruker of Germany is also strong in spectrometers, particularly NMR and ESR, and Sweden's LKB Sverige enjoys a good reputation for mass spectrometers. Leading suppliers of spectrophotometers are Philips, Bausch & Lomb (U.S.), and Zeiss (Germany).

Approximately 95 percent of the estimated $4.5 million market for **analyzers** in 1980 was supplied by imports. Slow expansion should enlarge demand to slightly more than $5 million in 1985. Technological trends favor newer instrumental methods over traditional wet chemical techniques. Automated analyzers, such as wet chemical analyzers, elemental analyzers, and autotitrators, are used mainly in the general chemical and pharmaceutical industries and to a lesser degree in educational institutions. Their use in the food and beverage industry is increasing, and applications are common in clinical analysis. Leading suppliers include the U.S. firms Beckman Instruments and Technicon, Eppendorf of Germany, Philips and Breda of the Netherlands, and the United Kingdom's EIL.

The Belgian **photometer** market is very small, estimated at $170,000 in 1980, and seems to have reached a plateau. Principal users in Belgium are research laboratories and the photographic and lighting industries. Almost all the market is supplied by imports. Principals include Hagner of Sweden and Boehringer of Germany.

The **densitometer** market is similarly pegged at $170,000 in 1980, with little growth projected. Incorporation of microprocessors into microdensitometers, however, could provide a sales advantage for U.S. suppliers. The market is totally supplied by imports, with 10 percent coming from the United States. Basic densitometers are sold by Switzerland (Gretag) and the Netherlands (Vitatron). Germany's Zeiss and America's Perkin-Elmer are active in the microdensitometer market.

Sales of **pH meters** are estimated at slightly more than $1.5 million in 1980. Price is a strong selling point in this highly competitive field (the average model costs about $600), and there are a very large number of suppliers, mostly European. The major Belgian markets are in the chemical industry and educational institutions. Most sales are for replacement of existing equipment; significant expansion is not expected. Sophisticated models that incorporate microprocessors are expected to account for the bulk of future sales. Principal suppliers are Philips and Electrofact of the Netherlands, Britain's EIL, Radiometer of Denmark, and the Swiss firm Metrohm.

The market for **microscopes** in 1980 was about $8.9 million, split fairly evenly between electron and optical types. An overall rise of about 15 percent is foreseen by 1985, with Belgian purchases reaching more than $10 million. Sales of electron microscopes have lagged somewhat, but a pickup is expected through spending by the metals and chemical industries and the industrially oriented universities, prompting a 20 percent market increase by 1985. Philips of the Netherlands is a strong competitor and has been gradually cornering the market; it now supplies the bulk of imported electron instruments. The United States has had a small share, but there were no U.S. imports in 1980. The previously high German share is also declining, and the Japanese are gradually gaining a foothold through the manufacturers JEOL and Hitachi.

Slow increases are forecast in the market for optical microscopes and accessories, with purchases coming primarily from educational establishments and the primary metals and fabricated metal products industries. The Belgian market is served by a number of small domestic producers, including OIP Optics. Imports were about $3.8 million in 1980, supplied primarily by Zeiss and Leitz of Germany and Wild of Switzerland. Japan increased its share significantly in 1980, mainly through the sales of Olympus and because of its competitive prices, is likly to gain an even stronger advantage.

The 1980 market for **laboratory balances** is estimated at $3 million, of which about 15 percent was supplied by local manufacturers, including Becker and MBLE. Major purchasers come from the educational, chemical, and pharmaceutical sectors. Industrial demand is increasing, particularly among food processors expanding their single-serving product lines. Demand from the food and pharmaceutical industries will play a role in the 12 percent boost in the market projected by 1985. Within a few years demand may focus almost exclusively on balances that include microprocessors, which could provide a good opportunity for U.S. suppliers to penetrate the market. The principal importing countries at present are Switzerland (Mettler) and Germany (Schenck and Sartorius).

Overall, the laboratory instrument categories likely to experience significant sales increases by 1985 are chromatographs (especially liquid) and data processing equipment for chromatography, spectrometers, microprocessor-controlled spectrophotometers, counters, and microscopes. Although the market is relatively small, substantial increases are foreseen in purchases of instruments for testing and inspection of physical properties, particularly in the primary metals and fabricated metal products industries. Growing markets are also forecast for chemical analyzers, electrophoresis apparatus, centrifuges, and laboratory balances incorporating microprocessors.

Major Purchasers

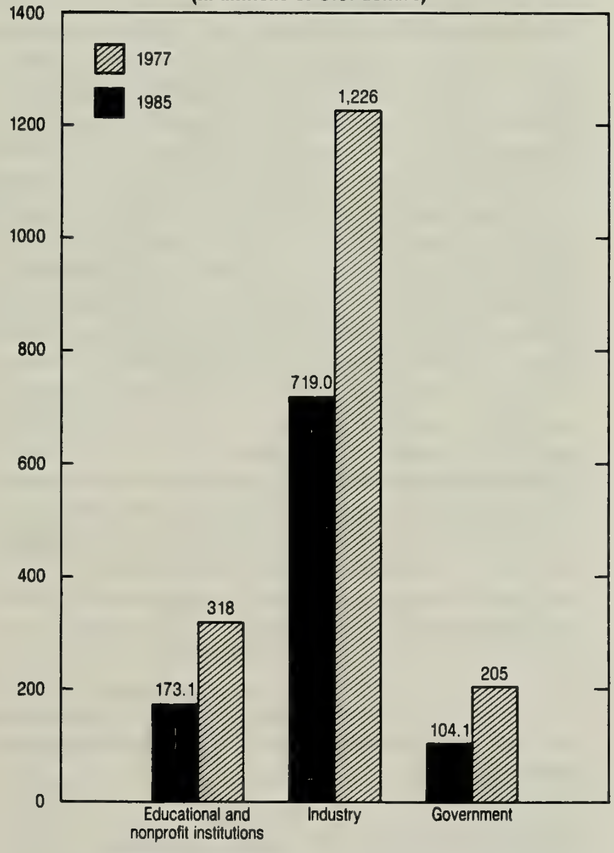
Belgium spends about 1.3 percent of its gross domstic product (GDP) on research and development. Of these R&D activities, more than two-thirds are carried out in the industrial sector, one-sixth in universities, and one-tenth in government supported research institutions. Total R&D expenditures in the natural sciences and engineering in 1977 (again, the latest available data) were more than $996 million (see figure 2). Such outlays are projected to total nearly $1.8 billion in 1985. In that year, industry is forecast to provide 69 percent of R&D funds and the Government 20 percent. Industry draws some funds from the public sector and is forecast to use about 70 prcent ($1.2 billion) of total 1985 R&D allocations. Government will spend about 60 percent of its own research money, with most of the balance going to educational and nonprofit institutions. These organizations are expected to provide 11 percent of R&D funding and to account for 18 percent of 1985 allocations. Purchases of laboratory instruments are expected to absorb about 4 percent of total R&D expenditures in 1985.

Belgium's Five-Year Plan for 1981-1985 gives some indication of areas that will be emphasized in future R&D efforts. Given pressure on public sector budgets and the economy in general, annual real growth in R&D outlays should proceed at a modest 2-3 percent pace. However, several sectors have been targeted for growth; biotechnology, new energy sources aid energy saving, electronics, and telecommunications. Particular emphasis will also be placed on industrial and commercial solutions to problems affecting the economy, and there will be more support for prototype development and innovation.

As of 1977, there were 19,284 people employed in the physical and life sciences, including 7,491 scientists and engineers and 11,793 technicians (see table 5). Of the scientists and engineers in R&D activities, about 50 percent are employed by educational and other nonprofit organizations, 40 percent by industry, and 10 percent by government. There is no shortage of technically qualified personnel in Belgium, and training is considered adequate except for some deficiencies in microelectronics. Belgian universities, such as Louvain, have high-quality technical reputations, and consequently most Belgian scientists are trained at home. Among those who spend some time abroad, the United States is a favored location for advanced study. The few foreign scientists in Belgium are employed mainly by multinational corporations, by research laboratories in some of the larger firms, and by the universities.

Laboratories in the chemicals industry.—The chemicals industry has been one of Belgium's stars in recent years, contributing 3.4 percent of gross national product (GNP) with a turnover of $3.8

Figure 2.—Belgium: R&D expenditures,[1] 1977 and projected 1985 (in millions of U.S. dollars)



[1] Represents expenditures on R&D performed in the designated sectors regardless of the original source of funds. Expenditures devoted to social science research are excluded.

Source: Belgian trade source estimates.

billion in 1979. It accounts for 16.5 percent of the country's exports. The industry suffered a setback in 1980; output fell by 6 percent as recessionary conditions became more generalized throughout Europe. Nevertheless, Belgium is still a major power in the European chemicals network. It has achieved a high productivity ratio and has accomplished efficient horizontal integration in petrochemicals, particularly in Flanders, supported by a well-developed transportation network. Output for the industry, the major industrial purchaser of laboratory instruments, is expected to grow at the same rate as the overall economy in the next few years. It will also be featured prominently in government policies to use energy more rationally, develop alternative energy sources, and reduce dependence on raw materials.

The industry's products are slightly oriented toward heavy chemicals. Several firms are diversifying internationally. Solvay, for example, recently took over the Dutch firm Duphar. The industry is also moving into biotechnology and products with higher value added. In 1980 the product groups that showed better than average growth were agricultural chemicals, pharmaceuticals, and cosmetics. This trend is predicted to continue through 1985. The 1980 employment total for the industry was 39,300, concentrated in the general chemicals sector.

Laboratories are operated by a mixture of foreign (predominantly American) multinationals such as Exxon, Monsanto, Procter & Gamble, and Union Carbide, and large Belgian firms such as Union Chimique-Chemische Bedrijven (UCB) and Solvay. Solvay, a Belgium based multinational with 45,000 employees, has the largest research facility. General laboratory expenditures in the chemicals industry were $278 million in 1977 and are projected to increase to $513 million in 1985. Instrument purchases, which emphasize advanced analytical equipment, amounted to $10.6 million in 1979, 18 percent of the Belgian total. Average annual growth in purchases should bring the 1985 sum to $13.8 million, 19 percent of the market.

Gas and liquid chromatography are basic analytical tools in the chemicals industry, and integration of these into computerized systems will continue. Both NMR and IR spectrophotometry are expected to find increased applications, particularly with automated instruments. Because Belgian labor is expensive, all automated equipment is in demand, and introduction of microprocessor controls in the industry will be rapid. Lab managers consider complete systems more reliable than automated installations assembled from separately sold items. But the industry is highly capable in control technology, and some demand for add-on of minicomputers can be expected. Laser and electro-optical methods will also have significant growth potential over the next few years.

Table 5.—Belgium: Persons employed as scientists, engineers, and technicians in the physical and life sciences, 1977

	Scientists and Engineers	Technicians
Employed by:		
Government	776	1,053
Industry	2,969	8,272
Educational and nonprofit institutions	3,746	2,468

Source: Values based on Official OECD R&D statistics.

Instruments in demand include chromatographs, colorimeters, electron microscopes, electrophoresis apparatus, mass spectrometers, polarimeters and spectropolarimeters, spectrometers, and laser and electro-optical equipment.

Laboratories in the primary metals industry.—Manufacturers of steel and nonferrous metals contribute 2 percent to Belgium's GNP and make up almost 18 percent of the country's exports. Production reached $2.2 billion in 1979. However, the Belgian steel industry is in great difficulty because of worldwide overcapacity and the age, inefficiency, and labor intensiveness of many of the country's plants. Output fell by 5 percent in 1980 and no early recovery is expected. Because of the industry's importance to Belgium, however, the Government will not allow it to collapse. In light of international anti-dumping agreements, government efforts should emphasize incentives to cut costs and modernize rather than direct subsidies.

The nonferrous metals sector is also handicapped by high wage costs, lack of primary energy sources, high costs of raw materials, and outmoded plants and processes. Falls in production are expected to continue for the near term.

The product groups within the primary metals industry that showed better than average performance in 1980 were wire rods and steel plates and tubing. Throughout the industry, a gradual recovery to 1979 production levels is expected by 1984. Total employment in the industry is over 65,000.

Five laboratories account for about 80 percent of all laboratory instrument sales in the primary metals industry. These laboratories are considered world-class centers in their respective fields of research and their equipment expenditures are relatively high. The Centre des Recherches Metallurgiques (CRM) is supported by the steel industry and is mainly involved in technical and applied research. Its annual budget is about $17 million, and it employs over 100 scientists. Other steel industry laboratories are operated by the Cockerill group and Siderurgie Maritime (SIDMAR). Metallurgie Hoboken-Overpelt, a major center for the nonferrous metals industry, is the same general size as CRM. Its work concentrates on copper and other metals used in more expensive alloys.

The metallurgical laboratories emphasize physical methods of analysis. Techniques in wide use include emission spectrometry based on spark emission, X-ray fluorescence and combustion analysis, and metal-burn techniques for measuring carbon dioxide, sulfur dioxide, nitrogen, and oxygen. Electroanalysis using ion-selective electrodes is finding more applications in the industry, indicating a growing market for electrodes in the large laboratories. Atomic absorption spectroscopy is used for general analysis but is being supplanted in some areas by plasma spectroscopy. X-ray diffraction is one of the commonly used research tools in physical metallurgy, and gas and liquid chromatography are used to a limited extent. In some instances, quadruple mass spectrometers are replacing gas chromatography for analysis of process gas. The use of electron microscopes is expected to increase throughout the industry. The Belgian steel industry has maintained longstanding relationships with various German companies in the Ruhr Valley and, as a consequence, much of the industry's laboratory equipment comes from German sources.

Laboratory expenditures in the primary metals industry totaled $60 million in 1977, and an increase to $96 million is predicted for 1985. Expenditures on instruments, pegged at $3.9 million in 1979, are expected to increase almost 4 percent yearly, reaching a $4.9 million total in 1985. Overall, there is a gradual move away from traditional physical methods of analysis toward newer instrumental techniques that utilize microprocessors. Minicomputers and microprocessors are becoming increasingly popular and are often used in conjunction with existing equipment, such as chromatographs and spectrometers. Most instrument purchases in this sector will be for those that incorporate some data processing capability, and there will also be a market for data-processing add-ons to existing equipment.

Other industrial laboratories.—The food and beverage industry has performed quite well in recent years. In 1979, it contributed 5 percent to Belgium's GNP and was responsible for 9.6 percent of the country's exports. As emphasis on testing food products for purity increases, demand for chemical analysis instruments should expand. Laboratory expenditures among food producers, which were $15 million in 1977, are expected to grow to $27 million in 1985. Instrument outlays for 1979 were $900,000, and the industry is expected to spend $1 million on instruments in 1985. Four major laboratories in the industry are Stella Artois (beer), Lacsoons (dairy products), Raffinerie Tirlemontoise (sugar and confectionery), and Van Der Moortele (edible oils).

The Belgian petroleum industry, with strong ties to the chemicals industry through petrochemicals, is represented by two large laboratories, Fina and Texaco. Both carry out a broad spectrum of R&D activities and provide technical services for refinneries. Analytical methods characteristic of organic chemistry are most commonly employed in these laboratories. Laboratory expenditures, including those of rubber and plastic product makers, will rise from $15 million in 1977 to $29 million in 1985, and instrument purchases are expected to increase from $1.3 million in 1979 to $1.5 million in 1985.

Another important Belgian laboratory is run by Ateliers de Constructions Electriques de Charleroi (ACEC). The facility employs about 75 scientists on its staff of 300. It conducts basic research in electrical engineering and solid-state physics along with a range of applied research for production of electrical generating equipment. The glass industry is represented by a laboratory of about 100 employees operated by Glaverbel.

Educational and nonprofit research laboratories.—After a period of strong expansion as well as language disputes that split several universities into separate institutions for French speakers and Flemish speakers, Belgian higher education is now stable. The student population is expected to decline slowly, and government spending on education may have reached a plateau. However, there is still a need to replace old or obsolete laboratory equipment. In addition, the declared objective of the 1981-1985 Plan to involve the universities in industrial applications research means that this sector will continue to be a large market for laboratory instruments. Overall laboratory expenditures were $168 million in 1977 and estimated at $308 million in 1985. Outlays for instruments, $9.7 million in 1979, will grow to $12 million by 1985, a 3.6 percent annual rate of increase.

Belgian universities employed about 3,700 scientists and engineers in 1977, and about one-fifths of the student population is studying science and technology. There are approximately 100 laboratories in the science and engineering departments and another 150 in the medical schools. Individual professors determine instrumentation and equipment needs. The acceptance of computer-controlled analytical systems is less rapid than in industry, but adaptation of existing equipment by adding on data processing capability is fairly common.

Much of the demand for laboratory instruments will continue to come from the chemistry departments, particularly as they undertake projects of industrial interest. Most types of spectrophotometers will be in demand, along with chromatographs, polarimeters, miscroscopes, and electrochemical instrumentation. Most of the instrument purchases come from the five major universities at Brussels, Louvain, Ghent, and Liege. Together they account for about three-fourths of instrument purchases in the educational sector.

Government laboratories.—The government laboratory sector in Belgium is composed of approximately 100 small labratories covering a wide range of fields. Many of them concentrate on testing activities. The Government does virtually no research and development and does not maintain large official laboratories. The major research centers with public participation are joint industry-government operations.

The government provides little R&D money to industry but does help fund the joint government-industry laboratories. The Government's active role in encouraging universities to undertake more industrially oriented work is beginning to produce results, indicated by the establishment of some university-industry laboratory parks.

The Government employed about 1,800 scientists, engineers, and technicians in 1977. Instrument purchases by the Government are relatively substantial because of its participation in the joint laboratories. Such outlays were pegged at more than $14 million in 1979 and are slated to reach more than $17 million in 1985. Total government laboratory expenditures were $104 million in 1977, with a projected increase to $206 million in 1985.

In addition to CEN's nuclear energy research, Belgonucleaire studies nuclear engineering and nuclear radiation measurement. The Government's joint laboratory with the electrical/electronic products industry, LABORELEC, focuses on research in power generation and distribution, electronics, and photometry. The Centre Belge de Recherches Navales (CEBERENA) conducts research related to shipbuilding. Railway equipment research is undertaken by the Construction Ferroviaires de Centre (CFC). Other laboratories include those of INIEX and the Societe Anonyme Belge de Constructeurs Aeronautiques (ABCA).

Trade and Technical Regulations

Customs duties on U.S. instruments shipped into Belgium range from 4.6 to 12.5 percent. A value-added tax is also assessed, based on the duty-paid value of the goods. This rate, 25 percent for most laboratory instruments, also applies to locally built equipment. Goods from Belgium's partners in the European Economic Community (EEC) enter duty-free.

The principal technical requirements covering laboratory instrumentation are concerned with electrical safety. As an EEC member, Belgium is subject to the "Low Voltage Directive," which applies to equipment designed for use with a voltage rating of between 50 and 1,000V for alternating current and between 75 and 1,500V for direct current. Equipment is considered safe if it carries the recognized approval mark of the national licensing authority of an EEC country or if the manufacturer makes a declaration that the product is safe according to the objectives of the Directive. The Comite Electrotechnique Belge (CEB) is authorized to examine and test equipment that requires approval.

Electrical current in Belgium is distributed at an alternating current of 50 cycles, three-phase. Common voltages are 100/190, 120/208, and 220/380.

Belgian buyers seldom purchase instruments directly from manufacturers, preferring to deal through the large number of agents and distributors, some of whom are in fact subsidiaries of the manufacturers. Agents and distributors are responsible for after-sales service and spare parts and usually arrange any training that may be needed for advanced instrumentation.

In this very competitive environment, ability to meet specifications and terms of payment and credit are more important than price in purchase decisions, particularly when more sophisticated equipment is involved. Individualized training for prospective purchasers to familiarize them with the equipment, provisional loan of equipment, and trade fair participation are all considered effective promotional methods. Good sales literature is also a definite asset, particularly when it is available in both French and Flemish. There are no local Belgian journals that cover the laboratory instrumentation field, although English-language publications are widely read. Fluctuating exchange rates make it difficult to quote firm prices to sales prospects, so exchange rate risk cover is becoming a normal part of doing business in Belgium.

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Country Market Survey

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Laboratory Instruments

Yugoslavia

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Despite economic difficulties and balance of payments problems, Yugoslavia's priorities for industrial and infrastructure development require continued high levels of investment in laboratory facilities and equipment. Trade sources indicate that, between 1981 and 1986, a 20 percent increase in spending for laboratory instruments will be necessary to keep pace with industrial, scientific, and medical expansion plans. The market for laboratory instruments, supplied almost entirely by imports, is forecast to rise 3.6 percent a year, from $96.6 million [1] in 1981 to $115.5 million in 1986 (see table 1 and figure).

Industrial laboratories account for about 75 percent of the instrument market in Yugoslavia. The biggest buyers are laboratories in the chemical, primary metals, and fabricated metals industries. These three rank among the priority concerns of the nation's economic planners, who want to expand domestic extractive and processing activities and reduce dependence on imported raw materials. Government efforts to curtail energy imports and to promote exports that earn hard currency are also expected to bring substantial increases in laboratory instrument purchases by end-users in gas and oil extraction, petroleum refining, and transportation activities. In each of these industries, instrument spending is forecast to increase well above the market rate during 1981-86.

Table 1.—Yugoslavia: Size of market for laboratory instruments 1979, 1981, and projected 1986

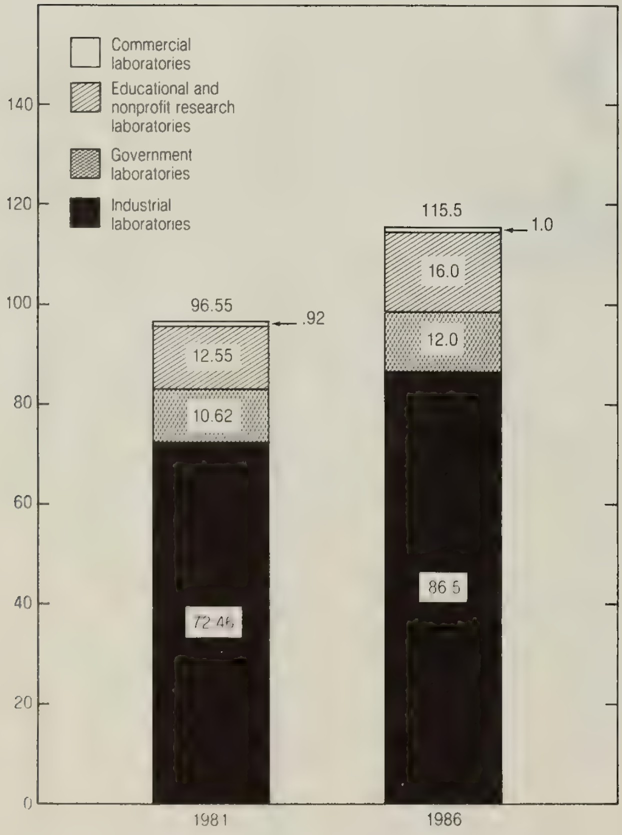
(in thousands of U.S. dollars)

	1979	1981	1986
Production	9,240	10,575	12,500
Imports	82,901	92,175	110,300
Exports	5,022	6,200	7,300
Market size [1]	87,119	96,550	115,500

[1] Market size equals production plus imports minus exports.
Source: Values based on Yugoslav trade source estimates.

Figure—Yugoslavia: The market for laboratory instruments, 1981 and projected 1986

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research report; values based on Yugoslav trade source estimates.

Among the other major end-users are the more than 680 laboratories maintained by educational and research institutions and Government organizations. Budget restraints are anticipated in these sectors. considerably dampening demand from Government facilities. Demand from educational and nonprofit research laboratories, however, is forecast to rise; these laboratories are important purchasers of advanced instrumentation, and by 1986, their spending is expected to account for about 14 percent of this market.

Competitive Environment

Steady expansion is foreseen for imports, which supplied 95 percent of the Yugoslav market in 1981 and are expected to maintain this dominance through 1986. Sales of imported instruments are projected at $110 million in 1986, up from $92.2 million in 1981. Serious foreign exchange shortages, however, are expected to affect sourcing. Observers predict currency restrictions will divert a considerable volume of these imports from European and U.S. suppliers to Communist Bloc sources in 1981-86.

Direct U.S. sales amounted to $14.7 million in 1981 and are projected to rise to $15.4 million in 1986 (see table 2). Despite this upward trend, the U.S. market share is expected to decline slightly, from 15 percent to 13 percent, largely as the result of hard currency restrictions.

Actual usage of U.S. brand name instruments is far greater than these import figures indicate, for the European subsidiaries of several American manufacturers also sell substantial quantities of laboraory instruments in Yugoslavia.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: US$1=19.00 dinars (1979), and 24.91 dinars (1980 and subsequent years). Values through 1980 are expressed in current rather than constant dollars: values for 1981 and subsequent years are expressed in 1980 constant dollars.

Local manufacture consists chiefly of measuring and testing equipment, and trade sources do not anticipate major increases in scope or output. Domestic production, valued at $10.6 million in 1981, is projected at $12.5 million in 1986. Exports amounted to $6.2 million in 1981 and should reach $7.3 million by 1986.

More than 50 enterprises manufacture laboratory instruments in Yugoslavia; most are small-scale undertakings employing fewer than 50 workers. Nine enterprises reportedly account for about half of the industry's home market sales. Several large engineering conglomerates, such as Iskra and Rade Koncar, produce measuring instrumentation as side activities. Among the enterprises that specialize in laboratory instruments and equipment are Lola Ribar in Karlovac (laboratory apparatus and sterilizing equipment); Institut za Elektroniko in Vakuumsko Tehniko, Ljubljana (vacuum measuring equipment, potentiometers, and a range of laboratory apparatus and furnishings); and ATM of Zagreb (industrial laboratory equipment). Other instrument makers large enough to export some of their output include Farmes OOUR Medik (instrumentation and glassware), Jugosanitarija (laboratory equipment, supplies, and glassware), Jugolaboratorija (laboratory instruments and apparatus, measuring instruments, and glassware), Tvornica Laboratorijskog (laboratory apparatus and thermometers), Vetprom (laboratory instruments and apparatus), and GIO (glassware).

West German manufacturers are the market leaders, recording sales of $29.5 million in 1981. The West German import share, 32 percent in 1981, is forecast to decline to 27 percent over the next 5 years, as foreign exchange restrictions shift some potential customers to East German sources.

Imports from suppliers in Communist Bloc countries, chiefly East German, Hungarian, and Soviet sources, were valued at $14.7 million in 1981, 16 percent of imports, and are projected at $26.5 million in 1986, a 24 percent share. Currency and price considerations combined with established barter arrangements favor a shift toward Bloc countries in the early 1980's despite the quality and technological advantages offered by instruments from other sources. East German manufacturers are the principal Bloc suppliers; their strengths are in optical instrumentation and glassware. Hungarian sources are established suppliers for many simple thermal and volume measuring instruments and are gaining experience in colorimetry, photometry, and densitometry. Russian sources provide mainly centrifuges and heavy laboratory plan.

Several other European manufacturers also compete effectively in Yugoslavia. Market proximity favors Austrian manufacturers, who provided imports valued at more than $10 million in 1981. Their strengths have been in optics and microscopes. Dutch firms garnered sales of over $7 million in 1981; among them is the subsidiary of a Japanese firm (Toshiba) providing a range of laboratory instrumentation.

More specific details on U.S. and third-country suppliers active in this market are contained in the original market research commissioned by the Department of Commerce in January 1982 (see Additional Information box).

Selected instrument markets.—Over the 1981-86 period, sales of **chromatographs** are expected to advance more rapidly than the general market, averaging an increase of 4.5 percent a year and rising to $8.7 million in 1986 (see table 3). Gas and liquid chromatographs are widely used in educational, food chemistry, petrochemical, pharmaceutical and other applications. Demand for thin layer instruments is developing in university laboratories. Three U.S. manufacturers, Beckman Instruments, Perkin-Elmer, and Varian Associates, are among the leading suppliers; their competitors include Labor (Hungary), Machery-Nagel (West Germany), and Pye Unicam (U.K.).

A marked increase is expected in **spectrometer** usage during the early 1980's; sales of these instruments are forecast to expand nearly 14 percent a year, providing a $7.5 million market by 1986. The major purchasers are physics laboratories and university graduate and post graduate facilities. Both nuclear magnetic resonance (NMR) and X-ray spectrometry are gaining in importance. Among the leading suppliers are West German (Siemens and Leitz), Japanese (Hitachi), U.S. (Perkin-Elmer), and Dutch (Philips) manufacturers.

By value, **spectrophotometers** represent the largest segment of the instrument market, registering sales of $11.7 million in 1981, with more than $15 million expected in 1986. Atomic absorption spectrometry (AAS) and ultraviolet (UV) techniques

Table 2—Yugoslavia: Imports of laboratiry instruments by country of origin, 1979, 1981, and 1986

(in thousands of U.S. dollars)

	1979	1981	1986
United States	14,259	14,748	15,440
West Germany	28,684	29,496	29,780
Communist Bloc	11,606	14,748	26,470
Austria	10,197	10,139	9,930
Netherlands	6,715	7,374	7,720
Others	11,440	15,670	20,960
Total	82,901	92,175	110,300

Source: Yugoslav Federal Institute for Statistics, Yugoslav National Bank, and trade source estimates.

Table 3.—Yugoslavia: Sales of selected laboratory instruments, 1981 and projected 1986

(in thousands of U.S. dollars)

	1981	1986
Chromatographs	6,940	8,660
Spectrometers	3,930	7,500
Spectrophotometers	11,750	15,020
Analyzers	7,300	12,240
Photometers	3,825	4,900
Densitometers	1,325	1,500
pH meters	2,175	2,310
Refractometers	2,715	3,350
Counters	1,535	1,440
Calorimeters	2,290	2,300
Hygrometers	1,080	1,160
Microscopes	4,430	5,490
Laboratory balances	2,210	2,890
Electrophoresis apparatus	2,125	3,480
Centrifuges/ultracentrifuges	3,150	4,630

Source: Values based on Yugoslav trade source estimates.

are widely used. Applications are chiefly in education and pure research, but usage is expanding in forensic criminology and colorimetry. Together British (Pye Unicam) and Japanese (Shimadzu and Hitachi) sources account for over half of sales. Other important competitors include Varian, selling instruments from is Swiss subsidiary, and Carl Zeiss of West Germany.

Many suppliers compete in the rapidly expanding **analyzer** market, where sales are forecast to increase nearly 11 percent a year in 1981-86, topping $12 million in 1986. Educational laboratories are the principal purchasers. Established U.S. suppliers include American Instrument, Varian, Beckman, Fisher Scientific and Instrumentation Laboratory supplying Yugoslavia from Italy. Other competitors are LKB (Sweden) supplying from Austria, Carl Zeiss Jena (East Germany), and two West German firms, Syva and Braun Melsungen.

U.S. manufacturers, including Beckman and American Instrument, presently supply about 30 percent of the **photometer** market. Trade sources foresee opportunities for further market penetration in coming years as annual sales of these instruments expand to $4.9 million in 1986. Hycel (France), Leitz (West Germany), C.G.A. Strumenti Scientifici (Italy), and Hungarian Optical (Hungary) have increased their sales in recent years and offer strong competition.

New applications in pharmaceuticals and graphic arts and expanding usage of paper and thin layer chromatography assure growing demand for **densitometers.** Sales of these instruments are forecast at $1.5 million in 1986. Major suppliers include Vitatron Scientific, Kodak, and Beckman from the United States as well as Kipp & Zonen (Netherlands), C.G.A. (Italy), and Labor (Hungary). Demand for **pH meters** is expected to be fairly static through 1986, when sales of $2.3 million are projected. The principal U.S. suppliers of pH meters are Corning Medical and Scientific and Fisher; among their competitors are Radiometer (Denmark), Philips (Netherlands), and EEL (U.K.).

Microscopes, with sales projected at $5.5 million in 1986, represent about 5 percent of the instrument market. Both compound and electron instruments are in demand; the latter are employed primarily in university and research laboratories. Although West Geman suppliers, chiefly Leitz and Carl Zeiss, enjoy an established position in this field, trade reports predict sourcing will broaden for instruments of middle range capability and price. Other vendors participating in this market are Nikon, Olympus, and Shimadzu of Japan and American Optical (U.S.).

Growth averaging 8 percent a year is expected in **centrifuge** sales, which are projected at $$4.6 million in 1986. Sourcing for this equipment is very diverse. Centrifuges from West German (Heraeus-Christ and WKF), British (Gallenkamp and MSE Scientific Instruments), Japanese (Hitachi), Italian (Eurospital), and U.S. (Beckman) manufacturers are all well known in Yugoslavian laboratories.

Major Purchasers

In R&D planning, Yugoslavia accords priority status to investments associated with energy, housing, heavy capital equipment, and export-oriented activities. The industries expected to be the primary users of R&D funds during the early 1980's are power generation, raw material extraction, building materials production, and chemical processing. Of secondary importance are transportation, other processing industries, and pure research of a scientific and educational nature. Funding in the health and safety fields is expected to concentrate on improving medical diagnostic capabilities. Significant investments in environmental control are not anticipated in coming years. Government is the source of about 38 percent of R&D funds. Most of the remainder is provided by industry.

Overall, laboratory expenditures are expected to increase nearly 4 percent a year in 1981-86, rising from $908 million to $1.1 billion (see table 4). Industrial laboratories spent about $688 million of the 1981 total, and budgets are expected to reach $834 million in 1986. In industrial and other types of laboratories, instrument purchases represent about 10 percent of total spending.

Educational and nonprofit research laboratories.—Expenditures for the 563 laboratories in this sector, $113 million in 1981, are forecast to climb to $144 million in 1986. More than 80 percent of these laboratories are teaching facilities. Yugoslavia's 18 universities maintain some of the best equipped laboratories in the country. Top quality installations are also found in the nonprofit sphere, particularly in laboratories operated by research institutes and manufacturing concerns under Government defense and atomic research contracts. These facilities include 10 laboratories dedicated to defense research. Atomic research is conducted at Boris Kidric Institute of Nuclear Science (University of Belgrade), Institut Jozef Stefan (Ljubljana), Institut Rudjer Boskovic (Zagreb), Electroprivreda Zagreb, Federal Institute for International Scientific, Educational, Cultural, and Technical Cooperation (Belgrade), and Zdruzena Electrogospodarska Podjetja Slovenije (Maribor). Also regarded as nonprofit are eight environmental laboratories maintained by water and sewage authorities in Sarajevo, Titograd, Zagreb, Skopje, Belgrade, Pristina, Novi Sad, and Ljubljana.

Instrument purchases for educational and nonprofit research laboratories are projected at $16 million in 1986, reflecting an increase of about 5 percent of the equipment currently used in these laboratories is imported. The following instruments are in general use: multichannel and amino acid analyzers; automatic integrating densitometers; gas and liquid chromatographs; scanning electron microscopes; phase integrators; data acquisition systems for gas chromatographs and mass spectrometers; UV, visible light, infrared, NMR, energy dispersive X-ray, and fluorescence spectrometers; goniometers, oscilloscopes; and activation analysis equipment. Over the next few years, instrument purchases for these laboratories should include analytical and densimetric balances; UV, flame, and AAS spectrophotometers; and centrifuges (under 6,000 rpm).

Government laboratories.—Some 2,000 scientists, 600 engineers, and more than 3,000 technicians are engaged in various types of pure and applied research in the 121 laboratories operated by government organizations. Activities range from agronomy and geology to nuclear engineering and molecular structural research. Laboratories in this sector utilize advanced instrumentation, much of it obtained from U.S. sources. Budget restraints are anticipated during the early 1980's, and government laboratory expenditures are forecast to increase a modest 2.7 percent a year, bringing outlays to $113 million in 1986. Annual spending for laboratory instruments is expected to rise from $10.6 million to $12 million over the 5-year period.

Chemical laboratories.—The chemical industry targets production at $890 million in 1986. Capital investments were about $200 million for the industry in 1981 and are expected to rise to $250 million in 1986. Output includes organic and heavy chemicals, petrochemical products, oils, paints, detergents, cosmetics, plastics, synthetic fibers, and pharmaceuticals.

Expenditures for the 435 chemical laboratories exceeded those of all other end-user sectors in 1981, totaling $120 million, and are expected to climb to $150 million in 1986. Chemical laboratories spent $12.6 million for laboratory instruments in 1981 and are expected to budget an aggregate of $15 million for instrumentation in 1986. The analytical

Table 4.—Yugoslavia: Laboratory expenditures by major end-users, estimated 1981 and projected 1986

(in millions of U.S. dollars)

	Number of laboratories	Laboratory expenditures 1981	Laboratory expenditures 1986	Purchases of laboratory instruments 1981	Purchases of laboratory instruments 1986
Government	121	98.83	112.8	10.62	12.0
Educational and nonprofit institutions	563	112.95	144.0	12.55	16.0
Independent commercial laboratories	54	8.28	9.0	.92	1.0
Industry					
Oil and gas extraction	4	30.88	48.0	3.86	6.0
Food products	128	9.30	7.5	1.89	1.5
Chemical	435	120.48	150.0	12.55	15.0
Petroleum	11	43.20	66.0	3.93	6.0
Rubber and plastic products	32	9.66	5.0	1.01	.5
Stone, clay, and glass	14	22.75	24.0	2.84	3.0
Primary metals	40	112.45	117.0	8.65	9.0
Fabricated metal products	137	81.53	96.0	6.76	8.0
Transportation	14	72.40	105.0	4.83	7.0
Other	375	185.00	215.0	26.14	30.5
Total	1,928	907.71	1,099.3	96.55	115.5

Source: Industrial and trade association sources and Ekonomska Politika.

techniques in use include chromatography, spectrometry, mass spectrometry, polarimetry and spectropolarimetry, refractometry, turbidimetry, nephelometry, radiometry, and electrometry. In pharmaceutical laboratories, colorimetry, electron microscopy, and electrophoresis are also employed. Among the instruments most widely used are air sampling and analysis equipment, automatic analyzers, gas chromatographs, infrared spectrophotometers, fluorimeters, energy-dispersive X-ray analyzers, activation analysis equipment, AAS and Fourier transform spectrophotometers, NMR and electron spin resonance (ESR) spectrometers, ion-sensitive electrodes, and amino acid analysis systems.

Computer applications have expanded in recent years. Closed computer systems have been installed in chemical laboratories for clinical and materials evaluation work. In pure research activities, demand is reportedly growing for interfacing gas and liquid chromatographs, NMR spectrometers, and amino acid analyzers with minicomputers.

Yugoslavia's largest petroleum and petrochemical producer, Industrije Nafte (INA), is heavily committed to product research and development. The INA conglomerate employs some 20,000 workers and has more than 60 laboratories. Oil derivatives are the primary focus of 23 INA laboratories; the largest of these are in Solin, Osijek, Zadar, and Dubrovnik. The INA lab in Zagreb researches plastics; facilities at Kutina specialize in artificial fertilizers; and the Lendava installation is dedicated to petrochemistry. Major investment programs at INA include collaboration with Dow Chemical on the eight-plant DINA petrochemical complex to be established on Krk Island. In addition, a new methanol plant (165,000 tons per year capacity) is under construction at the INA-NAFTA complex in Lendava.

Extensive laboratory facilities are also maintained by Hemijska Industrija Pancevo, another important chemical producer. A number of Pancevo laboratories are dedicated to specific products—the Backa Palanka facility concentrates on polyvinylchloride; the Odzaci laboratory researches polypropylene; and the chief concerns at Vrsac are methanol and softeners. Pancevo plans to complete 10 new plastics and organic chemical plants by 1986. Pancevo is also working with Naftagas to establish an Institute for Petrochemistry.

Primary metals laboratories.—Yugoslavia is seeking to improve production and processing of its mineral resources, which include copper ore, lead, zinc, iron ore, and bauxite. Existing facilities for steel and copper production are in need of modernization, and power shortages have kept aluminum output below capacity. Annual capital expenditures in primary metals are expected to rise from $200 million to $250 million annually over the 1980-86 period.

Funding for the industry's 40 laboratories is projected at $117 million in 1986. The analytical methods generally used in metals laboratories involve magnetic susceptibiliy, specromeric, electrometric, thermal, and X-ray techniques. Computer interfacing is becoming increasingly common. The major laboratories generally interface X-ray diffractometers with minicomputers and conduct continuous and accurate sample analysis on line. The instruments forecast to be in greatest demand during the early 1980's are light emission, X-ray, and NMR spectrometers, X-ray diffractometers, activation analysis equipment, particle size analyzers, and air sampling devices. Instrument purchases for these laboratories are projected at $9 million in 1986, with the five largest metals producers expected to account for almost 80 percent of this sum.

Extensive R&D facilities are maintained by RMK Zenica, a major iron and steel producer. RMK operates six research and test laboratories of its own and has long-term research contracts with the University Metallurgical School in Zenica and with three other laboratories in Sarajevo. In addition, RMK provides funds for work performed by the Institute for Mining, Chemical, and Technological Research in Tuzla, the Kirilo Savic Institute in Belgrade, and the Belgrade Institute for Machine Tools. At Ljubija, Vares, and Gornji Vakuf, RMK plans to construct new plants and laboratories that will require advanced instrumentation.

Large metals laboratories are also operated by Jugometal-Kombinat in Belgrade and in two of its subsidiaries, Metalurske Kombinat Smederevo in Smederevo and IMK in Urosevac. Jugometal plans to upgrade its Smederevo pig iron smelter, boosting steel output to 3 million tons by 1985. Additional laboratories are also planned for this plant. The Slovenske Zelezarne Steel Mills have large laboratories in Jesenice, Ravne, and Ljubljana and provide funds for the Metalurski Institute in Ljubljana. Other major laboratories include the facility maintained by Valjaonica Bakra i Aluminijuma in Titovo Uzice and the somewhat smaller but well-equipped laboratories operated by several other nonferrous metals producers. In total, the industry employs 870 scientists and 1,950 technicians for applied research, materials testing and evaluation, and process monitoring and control.

Other industrial laboratories.—The research laboratories and institutes funded by fabricated metals producers are reported by trade sources as offering good opportunities for sales of advanced instruments in coming years; purchases for these facilities are projected at $8 million in 1986. Laboratories in the petroleum processing and gas and oil extraction industries, which together are forecast to spend $12 million for instrumentation in 1986, make extensive use of X-ray and spark emission spectrometers; flame emission, AAS, and UV spectrophotometers; liquid chromatographs; and computer-linked analyzers. American-made instruments are highly respected by end-users in these industries. Laboratories associated with shipbuilding and truck manufacturing are the largest end-users in transportation; instrument purchases for transportation laboratories are expected to increase nearly 8 percent a year over the 1981-86 period, rising to $7 million in 1986.

Trade and Technical Regulations

Import tariffs are applied on an ad valorem basis. The rates applicable to laboratory instruments range from zero to 25 percent; in early 1982 most instruments were subject to rates between 10 and 15 percent. The following charges are also assessed on the dutiable value of imports: 1 percent customs evidence tax, 6 percent equalization tax, and an import surcharge that since 1976 has been 10 percent on most laboratory instruments. Instruments imported from Communist Bloc sources are not subject to customs duties.

The metric system of weights and measures is employed in Yugoslavia. Industrial electrical power supply is both 220 volts, single-phase, alternating current and 380 volts, three-phase, alternating current.

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Sales of medical equipment in Algeria are expected to reach $44 million[1] in 1985, rising at an average annual rate of 12 percent from the 1980 level of $25 million (see table 1). The market dipped sharply in 1978-79 because of a variety of factors including political changes, but with the implementation of the fourth national plan in December 1980, sales began to once again achieve the steady growth exhibited earlier. The 1982-83 decline in oil and gas demand reduced Algeria's revenues and current budget. Nevertheless, the health care sector remains a priority reaffirmed by the government mid-way through the plan which includes a major general hospital construction program now underway. In addition, the urgent unmet needs of the population for housing and medical care led the Government to embark, in 1982, on a major prefabricated building program which includes hospitals and clinics, contracted out on a turnkey basis, with authorizations for imports exempt from taxes and custom duties.

General hospitals will remain the most important end-users in the years ahead, followed by university medical centers and the military sector. Greatest demand is forecast for general hospital equipment and clinical laboratory equipment, both areas in which U.S. suppliers have made some penetration. Most purchases will be of simple, low-priced equipment. After 1985, however, an ambitious university hospital center construction program should result in substantially increased medical equipment market, including demand for more sophisticated products.

Table 1.—Algeria: Estimated market for medical equipment by application area, 1979-81 and projected 1985

(in millions of U.S. dollars)

	1979	1980	1981	1985
Cardiological equipment ...	1.5	1.6	1.9	2.3
Pulmonary apparatus	2.0	2.2	2.8	4.2
Neurological equipment ...	.3	.3	.5	.7
Ophthalmological equipment	1.0	1.1	1.3	1.6
Pediatric equipment	1.0	1.2	1.6	2.4
Renal equipment	.5	.6	.7	.9
Operating room equipment..	1.7	2.0	2.4	3.5
General hospital equipment.	7.9	8.7	10.0	15.2
Clinical laboratory equipment	2.5	3.0	3.9	6.0
Miscellaneous health care equipment	1.6	2.0	2.1	3.1
Disposables	.4	.5	.6	.8
Orthotic and prosthetic equipment	.8	.9	1.1	1.6
Architechtural, transport, and mobility equipment ..	.4	.5	.6	.7
Physical and occupational therapy equipment	.3	.3	.4	.8
Sensory aids and adaptive systems	.1	.1	.1	.2
Total	22.0	25.0	30.0	44.0

Source: International Trade Administration, Office of Trade Information Services market research study (see Additional Information box).

Competitive Assessment

All medical equipment purchased by Algerian end-users is supplied by foreign manufacturers. While domestic manufacture of simple equipment such as tools and some disposables is planned, production is not expected to begin before 1985.

U.S. firms supplied from 3.3 to 4.4 percent of the market during the late 1970's, with most sales concentrated in the cardiology and clinical laboratory segments. By 1985, imports from U.S. makers are forecast to reach $1.5 million, or 3.8 percent of the total (see table 2). U.S. firms active in Algeria in the last 2-3 years include Beckman Instruments (spectrometers, blood counters), Air Shields (infant incubators), Ohio Medical (electrocardiographs), and American Optical (ph meters, ophthalmological equipment).

The largest supplier country is France. By 1985, about 50 percent of all imports are expected to come from French makers. This strong position is partly due to long-standing links between France and Algeria and is helped by their use of a common language. The larger French firms operating in Algeria include Compagnie Générale de Radiologie (X-ray equipment), Thomson Medical Telco (electromedical equipment), Alvar (patient monitoring devices), Electronique Appliquée (cardiological equipment), Pesty Technomed (respirators), Villier (operating theatre equipment), Rhone-Poulenc (renal equipment), and Materiel Medical Scientifique (pediatric equipment).

German firms represent the second-largest group of suppliers, with roughly one-fourth of the total market. The well-diversified German medical equipment makers are able to provide a range of goods at competitive prices, and their share of the market is predicted to reach 22.8 percent by 1985. Some of the more important suppliers include Siemens (X-ray equipment), Zeiss (microscopes), Draeger (anesthesia and resuscitation equipment), Jaeger (pulmonary apparatus), Storz (endoscopes), and Bertholdt (diagnostic equipment).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=AD3.97 (1978), AD3.85 (1979), and AD3.84 (1980 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Other important supplier countries include Switzerland, the Netherlands (notably Philips), Sweden, Japan, Italy, and Hungary. An Algerian law forbidding the sale of medical equipment via agents has depressed the Swiss share of the market to about 2 percent from the 10-20 percent shares of 1976-78, and Swiss sales are expected to remain slim.

Many third-country firms serve the Algerian market from their sales offices in France.

Specific Product Markets

Cardiological equipment.—Reconstruction and refurnishing of older university hospital centers, such as the planned unit for cardiac surgery at Constantine, will provide some demand for cardiology equipment. Growth is expected to be slower than that of the total market, however, primarily because heart disease occurs less frequently in Algeria than in industrialized countries. Out of a total of 45,148 hospital beds in 1978 (see table 3), just 309 (.7 percent) were dedicated to cardiology. Still, a general need for such equipment should push sales to $2.3 million in 1985, with imports from the U.S. comprising 13 percent (see table 4).

Pulmonary apparatus. — Sales of pulmonary equipment are expected to reach $4.2 million in 1985, not quite double the 1980 figure, with U.S. suppliers providing 2.4 percent of the total. Most of this equipment will be relatively simple, because the treatment of the respiratory diseases most common in Algeria—tuberculosis, chronic pneumonia, and asthma—does not require sophisticated devices. Important end-users will be the growing number of health care centers and regional hospitals.

Neurological equipment.—Despite an anticipated average annual growth rate of 18.5 percent from 1980 onwards, demand for neurological equipment is small, and sales are predicted to reach only $700,000 by 1985. Prospects are limited because of a lack of qualified personnel. At present, only 202 ward beds and 8 operating rooms are set aside for neurosurgery.

Ophthalmological equipment.—Great needs for ophthalmological equipment exist in Algeria due to the widespread incidence of trachoma, but this segment has not achieved a high priority status in planning. Thus, sales are expected to grow only 7.8 percent a year, totaling $1.6 million in 1985. Current approved plans call for extensions of ophthalmological care at the Mustapha/Alger and Hussein-Dey university hospital centers. In addition, each new 240-bed standard hospital will contain a 30-bed ophthalmological ward, adding to the present total of 1,431 beds (3 percent of all) in wards specializing in ophthalmological care. This will in-

Table 2.—Algeria: Imports of medical equipment by country of origin 1978, 1979, and projected 1985
(in thousands of U.S. dollars)

	1978	1979	1985
Medical/surgical, electromedical diagnostic, ophthalmic apparatus (90.17) (excl. dental & vet.)			
United States	378	562	800
France	7,870	3,893	12,400
Germany	1,418	3,157	6,000
Switzerland	5,224	1,415	800
All other	1,168	4,884	3,200
Total	16,058	13,911	23,200
Electrocardiographs (90.17.01)			
United States	260	399	
France	1,010	425	
Germany	33	412	
All other	40	301	
Total	1,343	1,537	
Medical/surgical instruments and apparatus (90.17.11)			
United States	118	163	
France	6,860	3,468	
Switzerland	5,224	1,415	
Germany	1,385	2,745	
All other	1,128	4,583	
Total	14,715	12,374	
Mechanotherapy and respiratory appliances (90.18)			
United States	73	53	—
France	1,389	868	1,500
Sweden	205	301	—
Belgium	140	130	—
All other	187	202	1,000
Total	1,994	1,554	2,500
Mechanotherapy, massage appliances, etc. (90.18.01)			
United States	—	—	
France	399	87	
Switzerland	6	—	
All other	—	11	
Total	405	98	
Respiratory appliances (90.18.11)			
United States	73	53	
France	990	781	
Sweden	205	301	
Belgium	140	130	
All other	181	191	
Total	1,589	1,456	
X-ray apparatus, tubes, etc. (90.20)			
United States	162	36	—
France	1,235	571	3,600
Germany	1,212	1,425	1,400
All other	2,466	2,670	2,300
Total	5,075	4,702	7,300

Continued on page 4

crease the demand for equipment somewhat, but great needs will still be unfulfilled.

Pediatric equipment.—High birth and infant mortality rates are the underlying factors fueling a rising demand for pediatric equipment. The market is expected to grow at a 14.9-percent average annual rate, reaching $2.4 million in 1985. Most sales are expected to develop from the increasing number of regional hospitals, where each new 120-bed or 240-bed standard design includes a 30-bed pediatric ward. In addition, the number of maternity clinic/health centers at the community (daira) level is expected to approximately double during 1980-85.

Renal equipment.—Demand for renal equipment is limited and is expected to remain so because of the secondary importance of renal diseases in Algeria. The market is forecast to increase from $600,000 in 1980 to $900,000 in 1985, an average annual growth rate of 8.4 percent.

Operating room equipment.—Sales of operating room equipment are forecast to grow an average 11.8 percent annually, reaching $3.5 million in 1985. In general, most expenditures will be for unsophisticated equipment. Demand would be even

Table 2.—Algeria: Imports of medical equipment by country of origin 1978, 1979, and projected 1985—cont.

	1978	1979	1985
X-ray apparatus (90.20.01)			
United States	69	8	
Germany	805	951	
Netherlands	747	643	
France	668	294	
All other	1,013	1,718	
Total	3,302	3,614	
Apparatus using radioactive substances (90.20.11)			
United States	14	5	
France	259	82	
Switzerland	175	—	
Germany	103	—	
All other	23		
Total	574	185	
X-ray tubes (90.20.21)			
United States	6	—	
Germany	151	215	
Netherlands	92	25	
France	41	11	
All other	23	7	
Total	313	258	
X-ray screens (90.20.22)			
United States	1	—	
France	14	2	
All other	2	4	
Total	17	6	
Spare parts, accessories, etc. (90.20.23)			
United States	72	23	
France	253	184	
Italy	191	27	
Netherlands	156	63	
Germany	153	259	
All other	44	84	
Total	869	640	
Laboratory quipment (90.25)			
United States	286	499	700
France	708	415	2,000
Germany	2,515	1,057	1,500
Italy	192	127	400
All other	386	814	1,400
Total	4,087	2,912	6,000
Selected Sub Categories:			
Instruments and apparatus for physical and chemical analyses (90.25.01)			
United States	223	371	
Germany	2,239	939	
France	336	272	
Italy	175	124	
All other	318	406	
Total	3,291	2,112	
Instruments and apparatus for photometric, calorimetric, or acoustical measures (90.25.21)			
United States	7	6	
Germany	178	32	
France	101	64	
United Kingdom	—	256	
Hungary	21	—	
All other	3	33	
Total	310	391	
Microtomes (90.25.31)			
United States	—	17	
France	5	—	
Austria	—	25	
All other	1	3	
Total	6	45	
Spare parts and accessories (90.25.41)			
United States	27	83	
France	191	65	
Germany	61	70	
Italy	17	3	
All other	16	—	
Total	312	221	

Source: Annuaire statistique du commerce exterieur de l'Algerie, 1978, 1979 (Ministere des Finances, Direction des Douanes, Bureau des Statistiques) and International Trade Administration, Office of Trade Information Services market research study.

greater, however, except for a severe lack of surgeons and other qualified operating room personnel.

While the Algerian health system currently includes a total of 293 operating rooms, approved plans call for extended surgical services at a number of hospitals. Most important among these are new surgical wards planned at the university hospital centers at Mustapha/Alger, Hussein-Dey, Beni Messous, and Oran. Such wards are also planned at the large number of standard hospitals to be built.

General hospital equipment.—By far the largest market segment, general hospital equipment comprises nearly 35 percent of the total medical equipment market in Algeria. Sales are expected to increase 11.8 percent annually, reaching $15.2 million in 1985. Imports from the United States are predicted to climb at a much faster rate—averaging 30.8 percent annually—reaching $500,000 in 1985, or 3.3 percent of general hospital equipment purchases.

Clinical laboratory equipment.—The market for clinical laboratory equipment is one of the fastest growing areas, with sales expected to advance an average 14.9 percent annually, totaling $6 million in 1985. U.S. firms have achieved some penetration in this area, but their share of the market is expected to level off at $700,000—12 percent of the 1985 market.

Trends bolstering this segment include a shift in emphasis toward preventive medicine, as well as an increase in processing of physical examinations. Also, a substantial number of new regional (wilaya) laboratories are planned through 1985, with more sophisticated types of equipment needed to undertake tests that local laboratories are not able to perform. Demand for bacterial and parasitological analysis equipment is strong, due to the prevailing disease pattern. Use of automated analyzers is restricted, however, by a lack of trained operating personnel.

Table 3.—Algeria: Number of beds by specialty, 1978

	Number of beds
General medicine	8,989
General surgery	6,359
Psychiatry	6,005
Pulmonary / Tuberculosis	5,144
Pediatrics	4,204
Maternity	3,907
Gynecology/obstetrics	1,457
Opthalmology / Audiology	1,431
Endemic diseases	1,211
Others	6,441
Total	45,148

Source: MSP.

Miscellaneous health care equipment.—Sales of miscellaneous health care equipment are expected to amount to $3.1 million in 1985, an average annual rise of 9.2 percent from 1980. U.S. firms can anticipate supplying about 3.2 percent of the market at that time. Growth of this sector is keyed to the mounting importance of preventive medicine in government plans, and much can be done in this field in Algeria. The expanded use of prophylactic measures, especially in remote rural areas where the need is greatest, will call for new mobile testing systems, X-ray units for chest surveys, and other types of mobile equipment in general.

Disposables.—By 1985, the disposables market is expected to reach $800,000, a 9.9-percent annual increase over 1980. Substantial future growth of this segment is inhibited by two main factors: low labor costs in Algeria, which offset the economic advantages of using a disposable product, and the relatively low awareness of hygienic conditions. While the market for simple kinds of disposables may grow somewhat faster, future Algerian manufacturers will most probably supply the types of products required.

Rehabilitation aids.—The rehabilitation field is comparatively undeveloped in Algeria, but the trend for sales is moving upward in line with the total market. Sales of orthotic and prosthetic equipment are expected to grow to $1.6 million in 1985, an average annual increase of 12.2 percent.

The market for architectural, transport, and mobility equipment—dominated by wheelchairs and similar equipment—is forecast to expand at a slow but steady 7-percent average annual rate, amounting to $700,000 in 1985.

Physical and occupational therapy comprises a small, underdeveloped sector of the Algerian health care system, but a strong average annual growth rate of 21.7 percent is predicted for equipment sales as awareness of the needs of the handicapped grows. Sales are expected to total $800,000 in 1985.

The smallest segment of the medical equipment market in Algeria, sales of sensory aids and adaptive systems, are expected to total $200,000 in 1985, a 14.9-percent average annual growth rate from 1980. Hearing aids are the most common equipment in use, but other kinds of devices will also be required in the next few years.

Health Care System

Three governmental ministries are primarily responsible for health care in Algeria. The most important, the Ministry of Health (Ministère de la Santé Publique—MSP), is responsible for about 85 percent of all health care establishments (see table

Table 4.—Algeria: Estimated imports of medical equipment by application area, 1978-79 and projected 1985

(in millions of U.S. dollars)

	1978		1979		1985	
	Imports	From U.S.	Imports	From U.S.	Imports	From U.S.
Cardiology equipment	1.5	.2	1.5	.3	2.3	.3
Pulmonary apparatus	2.5	.1	2.0	—	4.2	.1
Neurological equipment	.5	—	.3	—	.7	—
Ophthalmological equipment	1.0	—	1.0	—	1.6	—
Pediatric equipment	1.5	—	1.0	—	2.4	—
Renal equipment	.5	—	.5	—	.9	—
Operating room equipment	2.0	—	1.7	—	3.5	—
General hospital equipment	13.1	.3	7.9	.2	15.2	.5
Clinical laboratory equipment	4.1	.3	2.5	.5	6.0	.7
Miscellaneous health care equipment	2.0	.1	1.6	—	3.1	.1
Disposables	.5	—	.4	—	.8	—
Orthotic and prosthetic equipment	.8	—	.8	—	1.6	—
Architechtural, transport, and mobility equipment	.5	—	.4	—	.7	—
Physical and occupational therapy equipment	.5	—	.3	—	.8	—
Sensory aids and adaptive systems	.1	—	.1	—	.2	—
Total	31.1	1.0	22.0	1.0	44.0	1.7

Source: See source notation of table 1.

5). The other two are the Ministry of Defense (Ministère de la Défense Nationale—MDN), charged with the health care of the armed forces, and the Ministry of Higher Education (Ministère de l'Ensèignement et de la Recherche Scientifique—MERS), responsible for the planned university medical centers (MSP is responsible for the existing ones, although this division of authority has caused some difficulties and is apt to change in the coming years).

In addition, the Social Security Organization (Securité Sociale) is responsible for mother and child care, care of the handicapped, and for establishing socio-medical centers close to living areas. The National Health Institute (Institut Nationale de Santé Publique) is responsible for training health personnel other than physicians.

Further, state-owned corporations (which include practically all medium- and large-size corporations in Algeria) often provide their own health care, although the MSP may come to play an increasing role in this area. At present, the largest corporations are the Société Nationale pour la Recherche, la Production, le Transport, la Transformation et la Commercialisation des Hydrocarbures (SONATRACH) and the Société Nationale de Sidérurgie (SNS), dealing with petroleum and steel, respectively. These corporations are responsible to various ministries, often the Ministries of Heavy and Light Industry.

The MSP has divided the country into 31 administrative units (wilayas), each headed by a regional director of health affairs. While the central MSP organization is responsible for funding and general direction of all its health care activities, hospitals are constructed, run, and owned by each wilaya. Smaller health care centers may also be owned by the 160 sub-regional units (dairas). In most cases, the health care establishments in a daira are grouped together in a secteur sanitaire, a separate board for all health care activities in the daira. There are 183 secteurs sanitaires.

The MDN organization is similar to the MSP in structure, but has only two levels—the central body and the wilaya operations. Usually, each wilaya has one military hospital, providing care only to military personnel and their dependents. This facility is usually located in the same town as the main defense installation or barracks.

The private sector in Algeria is insignificant, consisting mainly of private practitioners working half-time in their own practices and the rest of the time in MSP hospitals.

Annual expenditures for medical equipment, supplies, and furniture among all Algerian end-users are forecast to reach $185 million by 1985, an increase of almost $66 million from 1980 (see table 6). The general hospital sector which accounted for 54.4 percent of all expenditures in 1980, is expected to take a 57.2 percent share in 1985 due to an ambitious general hospital construction program. This program includes three 120-bed, twenty-nine 240-bed, and three 600-bed general hospitals under construction and three 120-bed, seven 240-

bed, and three 600-bed general hospitals under design/study. In addition, a rehabilitation program for existing general hospitals is underway. This program, restated in a June 1983 ministerial decision, will include equipping and strengthening specialized medical services in Algeria. The Government is anxious to stop the transfer of patients abroad for medical treatment and will limit financial support for that purpose.

The Government also launched in 1982, a major program of prefabricated housing, schools, and hospitals. With experience gained in rebuilding the El-Asnam area devastated by earthquakes, the Office National de la Promotion de la Construction en Prefabrique, set up in March 1982, let out some $1.55 billion of contracts by the end of the year. Western European firms won a major share of those contracts with the help of export credits and loans from their Governments. The contracts include 34 fully equipped hospitals and 60 polyclinics. French companies won most of the contracts but the British firm Clapp, in a joint venture with Tarmac, won a $178 million contract for four fully-equipped hospitals.

University medical centers are the second most important sector, but their share of expenditures is forecast to drop from 19.8 percent in 1980 to 15.8 percent in 1985 (see table 7), with stronger growth after 1985 as new centers come on stream.

Table 5.—Algeria: Health care sector profile, 1977 and 1980

Type of health care facility and responsible agency	Number of units 1977	Number of units 1980	Number of beds 1977	Number of beds 1980
Ministry of Health (MSP)				
General hospitals	183	155	45,029	44,887
Specialized hospitals		12		
Dispensaries	153	160	—	—
Health centers	620	653	—	—
Health care posts	1,325	1,728	—	—
Maternity wards	47	58	—	—
Other smaller and specialized health care units	323	389	—	—
Para-statal agencies				
Hospitals	—	13	—	300
Health cnters	—	715	—	—
Other smaller and specialized health care units	—	57	—	—
Private sector				
Maternity clinics	—	45	—	—
"Cabinets médicaux"	—	720	—	—
Other smaller and specialized health care units	—	36	—	—
Ministry of Defense (MDN)				
Hospitals	—	30	—	4,000

Source: International Trade Administration, Office of Trade Information Services research study.

Earlier plans for military university medical centers have been modified. However, construction of 8-10 military hospitals of either the 120-bed or 240-bed standard type are planned; in addition, a contract with the French firm Quillery was signed this July for a turnkey hospital complex including a military health complex with an 800 bed university hospital and a graduate school of health.

Marketing Practices

All export/import trade in Algeria is controlled by the State or state-owned enterprises. The key agency for medical equipment is the Pharmacie Centrale Algérienne (PCA), a central government authority operating under the MSP. PCA has the monopoly to import medical equipment for the state, para-statal, and private sectors, excluding the military. Military authorities may choose to either import directly or use PCA services. As a result, some 85-90 percent of all medical equipment purchases are channeled through PCA. The State owned "Office National de la Promotion de la Construction en Prefrabrique" (ONEP) has authority to sign contracts for prefabricated building including hospitals that are fully equipped, on a turnkey basis.

All PCA purchases are made through national or, usually, international competitive bidding, generally one to four times each year, as announced by advertisements in media such as the Algerian daily El Moudjahid, printed in French. Announcement of tenders are also available from the Trade Opportunity Program of the International Trade Administration, U.S. Department of Commerce. Commissioned agents are not allowed to operate in Algeria. However, under a recently liberalized law, distributors may do so. Although the time limit for delivery of bids is very short, generally from 2 weeks to 60 days from the first advertisement, a company interested in bidding should notify PCA as soon as possible, supplying as much information as it can and requesting an extension of the deadline.

PCA is required by law to accept only the lowest-priced offer. This policy, while theoretically sound, has caused some quality control and service inconveniences to the Algerians and may be modified in the years ahead.

However, substantially more is involved than a quick reply to a tender at the right price. Successful bidders have found it expedient to have their own staff in Algiers or, secondly, in France. Particularly in more substantial contracts, the Algerians would like the respective trading partner to be in the country before, during, and after the sale. In future, suppliers will probably be required to give technical assistance and guarantee the performance of the equipment for a certain period following delivery.

Table 6.—Algeria: Expenditures for medical equipment, supplies, and furniture by major user sectors, 1980 and projected 1985

(in millions of U.S. dollars)

	1980			1985		
	Equipment	Supplies	Furniture	Equipment	Supplies	Furniture
General hospitals	13.0	48.9	3.0	24.5	75.9	5.5
University medical centers	5.0	17.5	1.2	7.0	20.7	1.7
Spcialized medical institutions, e.g., cancer clinics	2.0	7.0	.5	3.3	10.0	.8
Military hospitals	3.0	10.5	.7	5.0	14.8	1.2
Clinical laboratories	1.5	3.0	.4	3.0	6.0	1.0
Mobile and permanent health care/population screening centers	.5	1.0	.3	1.2	2.4	.7
Physicians (private practitioners)	—	.1	—	—	.2	.1
Total	25.0	88.0	6.1	44.0	130.0	11.0

Source: See source notation of table 1.

If a staff office cannot be established, frequent visits are essential. Since business practices in Algeria tend to be time-consuming, with appointments not always held as originally scheduled, no visit ought to be shorter than a week. Further, with no advertising media for medical equipment in Algeria, the best form of sales promotion is personal visits.

All persons representing suppliers must have a good command of the French language, and all letters, telexes, documentation and promotional material must be in French.

Because requests for certain kinds of equipment do not originate in the PCA, which is basically a purchasing agent, but in the health care system itself, marketing efforts directed at the lower level decisionmakers can be undertaken. For example, in each of the secteurs sanitaires, a committee (conseil du secteur sanitaire) is responsible for proposing equipment needs. Marketing efforts could be directed towards the committee head, usually a local physician, pharmacist, or dentist.

The next key decisionmakers are the directors (Direction Regionale de la Santé Publique) of the wilayas. The directors are responsible for coordinating the requests from the secteurs sanitaire into regional requests, which are sent on to the PCA. At the PCA, a council of physicians and technicians makes the final choice of equipment. Since early 1982, wilayas have been authorized to issue international tenders, mainly for construction projects.

In the military system, a similar but simpler structure exists. At each wilaya the regional defense director (Directeur Régionale de la Defense) puts requests for medical equipment before the MDN where a council, similar to that at the PCA, examines the requests. MDN may then either make its own purchases or use PCA services.

In the MERS system, a commission consisting of physicians for each planned university medical center will review equipment lists proposed by the consultants involved. On the basis of this review, bidding proposals will be issued probably through the PCA.

Apart from the PCA, other government authorities also have sole rights to trade in certain products related to medical equipment. These include the Société Nationale des Constructions Mecaniques (SONACOME), vehicles for hospital use; the Société Nationale des Industries de la Cellulose (SONIC), paper disposables; and the Enterprise Nationale des Plastiques et Caoutchoucs (ENPC), plastic disposables.

Trade Regulations

Because of the centralized, state-controlled purchasing system and the lack of a domestic industry, no extensive trade restrictions are placed on medical equipment. Import duties total 28.75 percent of c.i.f. values for CCCN (BTN) classifications 90.18, .20, and .25, and 37.5 percent for 90.17.

Imports under contracts with ONEP for prefabricated hospitals and clinics are exempt from duties.

Nontariff barriers are unimportant for this category of products. Although some countries have preferential trade agreements with Algeria, this does not apply to any of the present or near-future potential suppliers of medical equipment.

The military sector is exempt from most trade regulations, including import duties.

Technical Standards

The MSP, through the PCA, plans to define standardized equipment lists for each type of health care unit and technical requirements for the more important product groups. PCA address:

Pharmacie Centrale Algerienne
2, rue Bichat
El Djazair, (Algiers) Algeria
Telephone: 65-68-27

The power system in Algeria is 220/380v, 50 cycles.

Table 7.—Algeria: Total planned expenditures for medical equipment by university hospital centers, 1980-84

(in millions of U.S. dollars)

Alger-Mustapha	30
Rouiba	5
Hussein-Dey	25
Ait Idir	5
Birtraria	10
Beni Messons	25
Douéra	10
Mers El Kebir	10
Oran	130
Sidi Chami	3
Constantine	30
Alger-El Kettar	5
Total	288

Source: 4th National Plan.

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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The Survey summarizes an 80-page research report prepared by Konsulterna of Stockholm, Sweden, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

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When placing an order for this research, please request "The Market for Medical Equipment—Algeria," ITA 81-12-505.

Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in Algeria and trade statistics compiled by the Department of Commerce's Bureau of the Census.

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Since the opening up of the Egyptian market in the mid-1970's, sales of computers and related equipment have grown rapidly, topping $17 million [1] in 1981 (see table 1). Continued expansion of business activity under economic liberalization measures that encourage foreign investment is expected to mean a steady 11 percent per annum growth over the 1981-86 period. By the latter year, a $28 million market for computer hardware is forecast. Despite stiff competition from European vendors with longstanding ties to Egyptian users, U.S. brands dominate the market, accounting for over 80 percent of projected sales (see table 2).

The market for **minicomputers** surged to nearly $15 million in 1980, largely as a result of a single $11.5 million Government purchase of 11 minicomputers supplied by the French company, SEMS, for the Ministry of the Interior. From a more realistic $11.7 million in 1981, sales are forecast to nearly double by 1986, attaining a $22.5 million level by the end of the period. Egypt's late entry into the minicomputer market caused rapid increases in sales as buyers caught up. The broad range of mini applications, coupled with low prices and ease of installation and operation, is projected to stimulate further growth. Industry observers note, however, that competition from microcomputers could limit expansion in the future.

Sales of **small, medium, and large computer systems** are foreseen showing modest 3 percent annual growth; from $5.3 million in 1981 to $6.2 million in 1986. Expansion or upgrading of existing systems, together with new installations in Government offices and in large businesses, underlie market growth. In all, the population of small, medium, and large systems is projected to more than double (from 94 to 214) between 1980 and 1986, with growth roughly equal for all size mainframes (see table 3).

Virtually all types of **peripheral equipment** have been marketed as systems components in Egypt. So far, few users have developed the expertise to integrate separately sold equipment. While most observers expect systems sales to remain the norm, strong demand for peripheral input, output, and storage devices could justify establishment of marketing/service facilities by independent peripherals manufacturers in the future.

Biggest buyers of computer hardware in Egypt are the Government, manufacturing concerns, and banks and financial institutions. Together these sectors accounted for over half the installed computer base at the end of 1980. They also generated over 80 percent of computer expenditures that year, in part because of a single large Government purchase. Trade sources predict that nearly 60 percent of hardware spending in 1986 will be attributable to these sectors of the economy (see table 4).

A November 1981 decree requiring every Government department to establish its own computerized data base and information system is expected to bolster demand from the public sector. Currently, fewer than 10 percent of Government organizations have their own hardware. Moreover, several international institutions and foreign governments have backed training and social development programs in Egypt that include computer systems.

In the private sector, Egyptian industrialists and other business people employ computers primarily for commercial data processing. Efforts to maintain 10 percent average annual growth in gross domestic product (GDP), though unlikely to be attained, will stimulate investment in productivity-enhancing au-

Table 1.—Egypt: The market [1] for computers and peripheral equipment, 1980, 1981 and 1986

(in thousands of U.S. dollars)

	1980	1981	1986
Minicomputers			
Production	—	—	—
Imports	14,985 [2]	11,714	22,525
Exports	—	—	—
Market size	14,985	11,714	22,525
Small, medium, and large computer systems			
Production	—	—	—
Imports	5,184	5,339	6,190
Exports	—	—	—
Market size	5,184	5,339	6,190
Peripherals (sold separately) [3]	—	—	—
Totals			
Production	—	—	—
Imports	20,169	17,053	28,715
Exports	—	—	—
Market size	20,169	17,053	28,715

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Includes French computers valued at $11.5 million sold by SEMS.

[3] No peripherals are separately sold in Egypt.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Egypt" (see Additional Information box). Figures in this report are based on data gathered in Egypt, including available government statistics, industry reports, and trade source estimates and projections.

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[1] All values are shown in U.S. dollars. Local currency data for all years are converted at the following exchange rates of US$=.83168 Egyptian pounds. Values for the years through 1980 are expressed in current rather than constant dollars/prices; values for 1981 and subsequent years are expressed in constant dollars/prices.

Table 2.—Egypt: Imports of computers and peripheral equipment [1] by country of origin, 1980, 1981 and 1986

	1980		1981		1986	
	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)
Minicomputers						
United Kingdom	100	.67	1,500	12.80	1,802	8.00
United States	405	2.70	1,277	10.90	2,253	10.00
France	11,500	76.74	—	—	1,126	5.00
Spain	200	1.34	—	—	451	2.00
Japan	—	—	—	—	1,126	5.00
Other [2]	2,780	18.55	8,937	76.30	15,767	70.00
Subtotal	14,985	100.00	11,714	100.00	22,525	100.00
Small, medium, and large computer systems						
United Kingdom	2,210	42.63	1,339	25.08	928	14.99
United States	372	7.18	500	9.37	642	10.37
France	—	—	—	—	124	2.00
Other [2]	2,602	50.19	3,500	65.55	4,496	72.64
Subtotal	5,184	100.00	5,339	100.00	6,190	100.00
Peripherals (imported separately) [3]	—	—	—	—	—	—
Total imports	20,169		17,053		28,715	
Total imports from U.S.	777		1,777		2,895	
U.S. share of total imports		3.85		10.42		10.08

[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

[2] Computers in this category are primarily American brands manufactured by third-country subsidiaries.

[3] No peripherals are separately imported in Egypt.

Source: See source notation of table 1.

tomation. Anticipated improvements in telecommunications facilities should also encourage local firms to adopt computerized methods.

Banks and financial institutions pioneered computerization in Egypt, and they have ambitious plans to expand their use of automated transaction handling. Shortages of investment funds and trained personnel hamper growth, and the sector's share of computer purchases is forecast to decline from 13.4 percent to 9.3 percent over 1980-86.

Even though several sectors have only recently begun computerizing, their low levels of hardware spending are projected to rise dramatically over the next few years. Education and research institutions, for example, are foreseen boosting their purchases from $540,000 in 1980 to $2 million in 1986. Retailers and wholesalers, as well as the vital tourism industry, are expected to invest heavily in mini-based systems. In the health care sector, the recent emergence of modern, privately run hospitals and clinics should precipitate substantial investment in advanced equipment, including computers. The transportation sector is foreseen doubling its hardware purchases over 1980-86 for a wide range of uses, to include control of traffic and collection of some $900 million in annual tolls for the Suez Canal.

Major Market Trends

Business and commercial data processing represent more than 90 percent of computer applications in Egypt. Both government and private sector users rely on computers for accounting, inventory and stock control, administration, and statistical analysis. Other applications range from industrial control and data communications to laboratory analysis. Industrial uses include process control at an aluminum plant; a complete monitoring, alarm, and report system at the Cairo West power station; and a load frequency control system for direct control of six electric power generators.

Computers are used for data communications by electric utilities, which employ them as front-end systems, terminal controllers in generating plants, and data concentrators at regional stations. The Arab Organization for Industrialization (AOI) relies on mini's for message switching between the organization's headquarters and its eight factories. AOI also handles document storage and retrieval with computers, using facsimile machines as input devices and graphic monitors as remote displays.

System acquisition.—Egyptian computer users tend to prefer buying over leasing; financial and tax regulations as well as local customs encourage own-

Table 3.—Egypt: Population of computers, by size,[1] 1980 and 1986

	1980		1986	
	Number of units	Percent of total	Number of units	Percent of total
Minicomputers	117	55.45	1,195	84.81
Small computers	44	20.85	100	7.09
Medium computers	38	18.01	87	6.17
Large computers	12	5.69	27	1.93
Total	211	100.00	1,409	100.00

[1] Computer size is based on the following examples of IBM processors and includes the equivalent processors of other manufacturers: minicomputers, IBM System 34; small computers, IBM 370/115, 370/125, and 370/135; medium computers, IBM 370/145 and 4330; and large computers, IBM 3030.

Source: See source notation of table 1.

ership. So far only about a fourth of computer hardware is leased. Trade sources note, however, that the pace of technological change should make leasing a more attractive alternative in the future.

Sole sourcing predominates in Egypt, with few organizations having enough in-house expertise to develop their own systems from components. Plug-compatible peripherals could find a market if offered by manufacturers willing and able to provide adequate service support.

Distributed vs. centralized processing.—Adoption of distributed processing has been hampered not only by the shortage of experienced EDP managers, but also by the country's meager telecommunications networks. Faced with the difficulty of electronically transmitting data from remote locations, some organizations use key-to-diskette or key-to-tape input devices, then send the media to a central location for processing. The only users of distributed techniques are a few banks, the Government computer ministry, and AOI, which links its Digital Equipment Corporation (DEC) hardware throughout the company's six factories and its headquarters.

Data communications.—Data transmission in Egypt is hindered by the poor quality of the overall communications network. The supply of telephone service lags demand by some 400,000 lines, and long distance callers can wait as long as 30 seconds for a dial tone. Data communications over the public network are limited to telex, which operates at 50 baud. Businesses often rely on leased phone lines for regular voice communications, but such lines are not available for data transmission. A few large State organizations have access to special networks offering data communications at up to 9,600 baud.

Very few modems are presently in use, but the local common carrier, Arab Republic of Egypt Telecommunications Network (ARETO), expects a surge in demand by 1985, when plans for improving the telecommunications network are expected to begin producing results. The Egyptian Government recently signed contracts with several American firms and a European consortium to install about 300,000 new lines over the next 2 years.

Automated business transactions systems.—Because of the dearth of communications channels, few automated business transactions systems have been installed in Egypt. Only the State-run National Bank of Egypt has bought cash dispensers, with the ultimate goal of switching to an automated credit transaction system.

Data entry, storage, and output.—Intelligent terminals that can serve as input devices (key-to-disk, -diskette, or -tape) and also handle some processing locally are expected to account for an increasing share of data entry. Add-on disk drives are popular for storage, though magnetic tape drives also retain a significant market share, especially in mini applications custom-tailored to user needs by a systems house. The growing demand for minicomputers is also forecast to entail strong sales of medium-speed impact printers. Graphic and cathode ray tube (CRT) displays are usually sold only as part of a complete system.

Software.—About 60 percent of the software sold in Egypt is provided by equipment manufacturers. Local development efforts focus on applications software by a few large users—Al-Ahram, Management and Computer Center (AMAC), the Cairo University Computer Center, and the Central Agency for Public Mobilization and Statistics (CAPMAS)—as well as on customizing standard applications packages from overseas for Egyptian use. Where programming is done in-house, Cobol, Fortran, and Basic are the predominant languages.

Systems software comes almost exclusively from the big hardware vendors. Virtually all users employ operating systems that come with the equipment. In addition, commonly used data base management systems include IBM's STAIRS and DMS, NCR's GENTAB, and International Computers Limited's (ICL's) IDMS and DMS. Applications packages from these firms cover statistics, planning and management, traffic analysis, and scientific subroutines.

Personnel.—The normal shortage of computer experts is exacerbated in Egypt by the drain of skilled programmers and systems specialists to other Arab countries offering much higher pay. The population of EDP manpower available locally numbers only 4,300, including 2,700 operators. Up to 70 percent of Egyptian computer scientists work overseas. However, trade sources anticipate the outflow

Table 4.—Egypt: Expenditures [1] for computers and peripheral equipment by major user sectors, 1980 and 1986

	1980		1986	
	Value ($ thousands)	Percent of total	Value ($ thousands)	Percent of total
Government	12,043	59.71	10,480	36.50
Manufacturing	1,832	9.08	3,371	11.74
Banking and finance	2,696	13.37	2,670	9.30
Insurance	255	1.26	244	0.85
Retailing and wholesaling	713	3.54	1,723	6.00
Transportation	746	3.70	1,462	5.09
Utilities	170	0.84	798	2.78
Communications	85	0.42	1,378	4.80
Health care	170	0.84	1,206	4.20
Education and research institutions	543	2.69	1,981	6.90
Publishing and printing	85	0.42	566	1.97
EDP service bureaus	288	1.43	652	2.27
Other	543	2.70	2,184	7.60
Total	20,169	100.00	28,715	100.00

[1] Excluding costs of software, hardware maintenance, sales commissions, etc.

Source: See source notation of table 1.

of talent to slow as Egyptian salaries rise, and by 1986 the number of domestically employed EDP personnel is forecast to approach 15,000.

Several institutions are training new personnel. Universities with full-scale computer science departments include Alexandria, Ain Shams, and El Azhar, while Cairo University and the American University offer a number of computer courses. Egyptian universities produce some 500 graduates each year. In addition, certain vendors operate training facilities that teach software and hardware maintenance to as many as 700 people a year.

Competitive Environment

American computer equipment, manufactured either in the United States or by third-country American subsidiaries, presently dominates the Egyptian market and is expected to retain an 80 percent share of sales through 1986 (see table 5). Enhancing the American position is the absence of domestic competition. In addition to their technological edge, U.S. computer makers enjoy a good reputation for after-sales service, customer support, and training. IBM, NCR, and DEC account for the largest portion of the installed computer base. Other prominent suppliers include Wang, Control Data Corporation (CDC), Data General, Perkin-Elmer, Burroughs, Texas Instruments, and Hewlett-Packard. Vendors with branch offices or qualified and active representatives attract the majority of Egyptian buyers.

Among third-country suppliers, Britain's ICL enjoyed strong support from CAPMAS through the early 1970's, enabling it to surpass IBM as the market leader. Cancellation of CAPMAS control over all Government computer purchases in 1975 revoked the privileged position previously occupied by ICL. Even so, the firm continues to profit from its established base, which encourages additional purchases in the relatively unsophisticated Egyptian market. Hardware currently supplied includes the 1900 and 2900 mainframes and the ME-29 minicomputer.

Competitive French firms, which sporadically make large sales, include SEMS and CII-HB, the Government-controlled firm made up of Compagnie Internationale d'Informatique, Machines Bull, and Honeywell's former French operation. Most purchases of CII-HB hardware go through a French system assembler, Compagnie Generale d'Automatisme (CGA), which participates in government-to-government transactions. The single large deal with the Egyptian Ministry of the Interior in 1980 boosted the French share of minicomputer imports to over 75 percent that year.

The Japanese manufacturer, Fujitsu, working with Spain's Sequenca, has sold only a few computer systems (total value: $250,000) in Egypt. However, trade sources anticipate a more energetic Japanese marketing effort by 1986.

Table 5.—Egypt: Cumulative number and value [1] of installed computers, by major suppliers, as of December 31, 1980

	Number of units	Value ($ thousands)	Share of total value (%)
SEMS (France)	11	11,500	20.98
ICL (U.K.)	40	11,200	20.43
IBM	29	10,500	19.16
NCR	61	9,200	16.78
CII-HB (France)	4	3,500	6.38
DEC	16	3,000	5.47
CDC	8	2,252	4.11
Data General	8	1,550	2.83
Perkin-Elmer Data Systems	14	700	1.28
Burroughs	7	400	0.73
Hewlett-Packard	1	300	0.55
Wang	6	290	0.53
Sequenca (Spain)[2]	3	240	0.44
Texas Instruments	3	180	0.33
Total	211	54,812	100.00

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

[2] Sequenca manufactures computer equipment in Spain under license from the Japanese company, Fujitsu.

Source: See source notation of table 1.

Additional Information

The project officers responsible for Country Market Surveys on Computers and Peripheral Equipment are:

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The Survey summarizes a 65-page International Market Research (IMR) report prepared by Fiani & Partners in Cairo under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Egypt and not those of the Department of Commerce.

The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, the size and structure of the market, a full assessment of various market trends, and an in-depth analysis of the current and prospective competitive position held by U.S. suppliers vis-a-vis Egyptian domestic manufacturers and other foreign suppliers.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

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After a steep decline in the economy in 1982 and the most severe drought in memory, continued weakness in demand is projected through 1983. Nevertheless, the market for medical equipment in South Africa, an estimated $86 million in 1979, is projected to reach $184 million[1] in 1985 (see table 1). Several factors are considered instrumental in driving up the market: the numerous health care projects that will be implemented, the growth of the replacement market for medical equipment, and the importance placed by the South African Government in improvements in the country's health care system.

Table 1.—South Africa: Estimated market for medical equipment by application area, 1979-81 and projected 1985

(in millions of U.S. dollars)

	1979	1980	1981	1985
Cardiological equipment ...	7.1	9.6	11.2	17.5
Pulmonary apparatus	3.3	4.1	4.8	7.0
Neurological equipment ...	1.8	2.2	2.5	3.5
Ophthalmological equipment	2.4	3.1	3.6	5.0
Pediatric equipment	4.4	5.4	6.1	8.0
Renal equipment	5.0	6.4	7.4	11.0
Operating room equipment..	15.8	21.5	23.7	35.0
General hospital equipment.	22.8	29.3	33.5	48.0
Clinical laboratory equipment	7.8	9.6	10.7	14.0
Miscellaneous health care equipment	2.6	3.3	3.7	5.0
Disposables	4.1	5.4	6.3	10.0
Orthotic and prosthetic equipment	3.1	3.9	4.4	6.5
Architechtural, transport, and mobility equipment ..	1.1	1.3	1.5	2.5
Physical and occupational therapy equipment	3.5	4.4	5.1	7.5
Sensory aids and adaptive systems	1.6	2.0	2.3	3.5
Total	86.4	111.5	126.8	184.0

Source: Official South African import statistics, official exporter country statistics, and International Trade Administration, Office of Trade Information Services market research study (see Additional Information box).

The many hospitals planned or under construction or slated for modernization are expected to promote rapid growth in the sales of cardiological and operating room equipment. At the same time, demand for disposables is likely to rise quickly owing to an increasing desire to control both costs and the risk of infection.

Because domestic manufacture is centered on the production of medical supplies and furniture, imports of medical equipment are expected to continue to account for nearly three-quarters of domestic sales. U.S. exports to South Africa were hurt by the recession in 1982 (see table 2) along with those of third country suppliers and this decline has continued into 1983. An upturn is forecast for 1984 as the impact of economic recovery in the U.S. and other industralized countries reaches South Africa. U.S. companies have continued to maintain their market share and are expected to supply nearly one-third of the medical import market in 1985.

Competitive Assessment

Local industry.—At present, the South African medical equipment industry, entirely privately-owned, manufactures relatively unsophisticated products. Although the industry is being encouraged to expand its product range and the Government gives preferential treatment to domestic producers in its tendering procedures, most medical equipment will continue to be imported for the foreseeable future.

Domestic output of medical products generally consists of sterilizers, anesthetic equipment, gas absorbers, and certain types of electronic monitoring equipment—products that could be used in other industries besides the health care industry. In addition, many South African firms manufacture disposables, including tubes, bags, cannulae, syringes, needles, sutures, and gloves. Domestic companies accounted for about half of all sales of disposables in 1979, and are expected to increase their share to roughly two-thirds in 1985.

Sales of domestically produced medical equipment, furniture and supplies in 1979 totaled an estimated $125 million. Of this amount, equipment accounted for about $7 million and supplies, approximately $62 million. The 9 most important firms among the 28 manufacturers are Art Medical, offering anesthetic equipment; Johnson & Johnson (Pty) Ltd., disposables; Kendall Co. of SA (Pty) Ltd., an extensive range of hospital supplies; 3M Medical Products Division, surgical drapes, sutures, and anesthetic items; American Hospital Supply Company (Pty) Ltd., disposables and monitoring electrodes; CE Medical (Pty) Ltd., anesthesia equipment and pathology disposables; Meditek (Pty) Ltd., orthopedic equipment; Latex Products (Pty) Ltd., catheters, disposables, and neonatal resuscitators; and the Protea Group of Companies, surgical instruments, autoclaves, disposable syringes, and orthopedic equipment. Most of these firms are subsidiaries of U.S. companies.

Domestically produced medical equipment and

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=R 0.83 (1979) and R 0.80 (1980 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 2.—South Africa: Exports of medical equipment from the United States, 1978-82
(in thousands of U.S. dollars)

	1978	1979	1980	1981	1982	Percentage change 1978-82	Percentage change 1981-82
Medical instruments							
Pacemakers	113	496	392	599	307	171	–48
Diathermy units	1	32	15	17	7	600	–58
Ultrasonic therapeutic devices	123	30	400	213	86	–30	–59
Other therapeutic apparatus	354	628	947	1,738	1,967	455	13
Electrocardiographs	166	105	247	220	136	–18	–38
Electroencephalographs	..	..	14	102	87		
Complete patient monitoring systems	382	641	1,050	2,193	1,367	257	–37
Electromedical apparatus, NSPF	936	1,715	2,864	3,583	4,190	347	16
Electromedical apparatus parts	1,497	2,190	3,632	4,053	2,786	86	–31
X-ray tubes	137	41	131	107	102	–25	–4
Parts for X-ray tubes	2	7	3	17	124	6,100	629
X-ray apparatus and parts for medical or dental use	202	1,762	551	744	842	316	13
Radiological apparatus and parts for medical or dental use	133	289	350	67	72	–45	7
Ophthalmic instruments and appliances and parts	446	524	750	1,190	979	119	–17
Anesthetic apparatus and instr. and pts. (exc. syringes)	60	54	84	159	104	73	–34
Bougies, catheters, drains, and soundes and parts	712	1,016	1,597	1,349	2,104	195	55
Basal metabolism and blood pressure apparatus, and parts	300	551	828	696	716	138	2
Hypodermic syringes, and parts	225	256	404	614	504	124	–17
Other syringes, and parts, NSPF	26	27	384	325	80	207	–75
Other medical, etc. instruments and apparatus, and parts, NSPF	1,813	2,272	2,526	2,720	3,407	87	25
Subtotal	7,630	12,634	17,169	20,707	19,966	161	–3
Medical and hospital appliances and equipment							
Sterilizers and autoclaves and parts	115	87	147	208	446	287	114
Wheelchairs, and parts	15	21	3	31	1	–93	–96
Other hospital, medical, dental, etc. furniture, NSPF	293	554	900	867	769	162	–11
Mechanotherapy appliances and massage apparatus, and parts	26	52	155	489	175	573	–64
Artificial respiration, ozone, oxygen, aerosol therapy etc.[1]	752	813	1,315	..	..	–99	
Artificial respiration, NSPF	..	..	..	1,175	1,267		
Hearing aids and parts, NSPF	77	22	18	56	65	–15	16
Bone and joint prosthesis, plates, screws, nails, etc.	870	591	724	553	832	–4	50
Other orthopedic appliances	304	595	692	957	881	189	–7
Subtotal	2,451	2,735	3,953	4,337	4,436	–99	–99
Medical supplies							
Opacifying prep. for radiological exam.	181	157	260	638	327	80	–48
Other diagnostic agents (exc. biological) NSPF	268	371	315	453	550	105	21
Waddings, gauze, dressings, etc. w/medicinals	100	60	39	158	46	–53	–70
Other waddings etc. NSPF	366	331	496	689	411	12	–40
Surgical sutures and materials etc., sterile	601	377	134	89	157	–73	76
Surgical and medical gloves	9	15	43	57	16	77	–71
Hypodermic needles	247	246	327	194	277	12	42
X-ray film, medical, exc. dental	2,048	1,645	1,033	1,165	593	–71	–49
Other X-ray film	280	242	1,258	1,498	294	5	–80
Contact, ophthalmic lenses not mounted	80	224	289	360	243	203	–32
Other ophthalmic lenses	900	1,209	1,857	2,393	2,193	143	–8
Eyeglass, etc. frames, mountings and parts[2]	87	..	..	..	..	–99	
Eyeglass fronts and temples	..	28	71	232	41		
Parts, NSPF, for eyeglasses, lorgnettes, goggles, etc.	..	89	271	331	204		
Subtotal	5,168	4,993	6,382	8,256	5,350	3	–35
Total	15,248	20,361	27,504	33,299	29,752	95	–10

Source: Compiled from official statistics of the U.S. Department of Commerce, Bureau of the Census. Minor discrepancies in totals are due to rounding.

[1] Product category was subdivided in 1981.

[2] Product category was subdivided in 1979.

Table 3.—South Africa: Estimated imports of medical equipment by application area, 1978-79 and projected 1985

(in millions of U.S. dollars)

	1978		1979		1985	
	Imports	From U.S.	Imports	From U.S.	Imports	From U.S.
Cardiology equipment	3.6	1.4	5.2	2.1	12.7	5.3
Pulmonary apparatus	1.5	.5	2.1	.8	4.4	1.5
Neurological equipment	.9	.4	1.2	.4	2.3	.8
Ophthalmological equipment	1.3	.5	1.7	.7	3.6	1.5
Pediatric equipment	2.2	.8	3.2	1.1	5.7	2.0
Renal equipment	2.5	.9	3.6	1.1	7.9	2.5
Operating room equipment	8.1	3.1	11.6	4.5	26.0	10.4
General hospital equipment	13.8	1.2	16.8	2.3	40.0	7.2
Clinical laboratory equipment	5.2	1.6	6.6	1.8	10.0	3.0
Miscellaneous health care equipment	1.1	.2	1.4	.3	3.0	1.3
Disposables	1.5	.4	2.1	.7	3.5	1.3
Orthotic and prosthetic equipment	2.0	.8	2.4	1.2	4.2	2.1
Architechtural, transport, and mobility equipment	.5	..	.7	.1	1.5	.2
Physical and occupational therapy equipment	2.4	.2	2.9	.2	5.0	.4
Sensory aids and adaptive systems	1.0	.1	1.1	.1	2.2	.2
Total	47.6	12.1	62.6	17.4	132.0	39.7

Source: See source notation of table 1.

supplies have the advantage over imported products of lower price and faster and more secure deliveries. However, local small and medium-size companies suffer from a lack of economy of scale as well as a shortage of spare parts and trained maintenance personnel. In addition, the shortage of skilled technicians is expected to limit attempts to increase the range and volume of medical equipment production.

U.S. companies.—Imports from U.S. manufacturers accounted for nearly 28 percent of all imports and 20 percent of total sales in 1979 (see table 3). The U.S. position is improving, and 1985 sales are projected to reach $39 million despite lower exports in 1982. The strength of U.S. companies in the South African market is attributed both to a significant increase in demand for medical equipment and to a particularly great interest in products, such as electromedical devices, monitoring systems, and processor-based diagnostic and therapeutic equipment, for which U.S. firms have demonstrated competitiveness. In addition, a few U.S. companies have succeeded by virtue of their superior marketing tactics. Those U.S. suppliers holding a dominant position include Hewlett-Packard (cardiology equipment), Travenol (renal equipment), Welch Allyn (ophthalmological equipment), Beckman (clinical laboratory equipment), and Medtronic (pacemakers).

According to South African end-users, U.S. manufacturers are highly regarded because of the quality of their products and their ability to develop and market new, efficient, and labor-saving systems and devices. Moreover, several U.S. companies owe their success to cooperation with local agents and the provision of servicing, maintenance, and training facilities within the country.

Third-country suppliers. — Germany was the major third-country source of medical equipment in 1979, accounting for about one-fourth of all imports (see table 4). The quality of German products is said to be one factor in their popularity. British manufacturers held a 15-percent share of the import market in 1979, although this has reportedly fallen steadily in recent years, owing in part to inferior product quality, a poor reputation for delivery, maintenance, and servicing, and inflexibility with respect to customer requirements. Japanese companies, which are reportedly increasing their share of the market, accounted for 6 percent of all medical equipment imports in 1979. Other third-country suppliers active in the South African market include Dutch, French, Israeli, Swedish, and Danish firms.

The success of third-country manufacturers in the South African market can be attributed to several marketing techniques: concentration on a specific product area, development of bilingual sales forces that focus on good relations with key decisionmakers, use of small exhibitions to introduce new products, and provision of good maintenance and service by trained technicians.

The German firm Siemens is a major supplier of general hospital equipment. Other leading German competitors include Zeiss and Leitz (clinical laboratory equipment), Heine and Draeger (operating room equipment), and Hellige, Bertholdt, and Storz (general hospital equipment).

British firms that compete successfully in the marketplace include Medishield, Matburn, and Eschmann, which supply operating room equipment, and GEC, which manufactures general hospital equipment. Several Japanese companies are particularly competitive in the supply of general hospital equipment (Terumo, Mitsubishi, Toshiba, and Fukuda), cardiological equipment (Nihon-Kohden), and clinical laboratory equipment (Olympus). The Dutch manufacturer, Philips, maintains a dominant position among suppliers of general hospital equipment, while the French company CGR has a small share of this market segment. General hospital equipment is also supplied by the Israeli firms of Mennen-Greatback and Elscint.

Table 4.—South Africa: Imports of medical equipment by country of origin, 1978-79 and projected 1985

(in millions of U.S. dollars)

	1978	1979	1981	1985
Medical, dental, surgical instruments and equipment (90.17)				
United States	7.21	10.59	14.17	25.0
United Kingdom	3.32	4.53	5.30	
Japan	1.36	2.11	3.85	
Germany	2.63	4.01	3.79	
All other	3.98	5.31	7.27	
Total	18.51	26.55	34.38	61.0
Electromedical equipment (90.17.10)				
United States	2.53	3.92	5.10	9.5
Germany	.86	1.28	1.13	
Japan	.69	1.16	.89	
United Kingdom	.59	.96	.77	
All other	1.42	1.89	2.46	
Total	6.09	9.21	10.35	23.0
Mechanotherapy and respiratory appliances (90.18)				
United States	.97	1.35	1.83	3.5
Germany	2.43	3.38	1.24	
United Kingdom	1.39	1.53	.74	
Japan	.24	.36	.58	
All other	1.08	.87	1.34	
Total	6.11	7.49	5.73	14.0
X-ray apparatus (90.20)				
United States	.94	2.11	3.50	5.7
Germany	4.03	5.27	7.95	
Netherlands	2.47	2.89	1.74	
United Kingdom	.79	.93	.91	
Japan	.38	.66	1.44	
All other	3.95	3.51	4.24	
Total	12.56	15.37	20.17	37.0
Instruments and apparatus for physical and chemical analysis (90.25)				
United States	1.62	1.84	2.94	3.0
United Kingdom	1.37	1.65	1.23	
Germany	1.11	1.62	.94	
Japan	.41	.52	.13	
All other	.72	1.05	1.08	
Total	5.23	6.68	6.32	10.0

Source: See source notation of table 1.

Specific Product Markets

Cardiological equipment.—The emphasis on treating cardiovascular disease, one of the major causes of death in South Africa, is likely to spur sales of various types of cardiological equipment (see Most Salable Products Box). In 1979, imports supplied 73 percent of the cardiological equipment purchased by South African end-users, with U.S. companies accounting for 40 percent of imports. Total sales, $7.1 million in 1979, are forecast to reach $17.5 million in 1985, with purchases from U.S. companies amounting to $5.3 million.

Because of increasing staff shortage, intensive care units are expected to be in high demand, and as new hospitals are built and old ones re-equipped, sales of ECG machines, defibrillators, cardiotachometers, and intracardiac catheters will reportedly be strong. More than 15 hospitals are equipped with bedside and central station intensive care monitoring units, and computerized cardiac catheterization systems have recently been installed in three hospitals. The use of computer-based ECG analysis and recordkeeping systems and of sophisticated diagnotic devices such as cardiac output analyzers and echo-cardiographs is also expected to offer significant sales opportunities.

The major U.S. companies active in the supply of cardiological equipment include Hewlett Packard, Ohio Medical, and AHSC, all of which enjoy a good or strong market position. Third-country manufacturers selling cardiological equipment include Philips and Nihon-Kohden.

Pulmonary apparatus.—Because of the high incidence of pulmonary disease—and especially of tuberculosis—both diagnostic and therapeutic pulmonary equipment is extensively used in South Africa. Total sales, which stood at $3.3 million in 1979, are expected to more than double in the next few years, reaching $7 million in 1985. Over half of all pulmonary apparatus requirements were met by imports in 1979 (63 percent), a share that is likely to be maintained through 1985. U.S. companies, which supplied $800,000 worth of equipment in 1979, should see their sales rise to $1.5 million in 1985.

In addition to demand by the industrial and

Most Salable Products

Cardiology Equipment
- Intensive care units
- Electrocardiographs
- Defibrillators
- Cardiotachometers
- Intracardiac catheters
- Cardiac output analyzers
- Echocardiographs

Pulmonary Apparatus
- Diagnostic equipment for
  - lung capacity
  - breathing frequency and movements
  - lung perfusion
- Computer-based integrated lung test and analysis systems
- Ultrasonic nebulizers
- Electronically controlled respirators for use in surgery
- Positive breathing equipment
- Reanimation units—stationary and mobile

Neurological Equipment
- Computerized systems for analysis of electrocardiograms

Ophthalmological Equipment
- Ophthalmoscopes
- Paramedics equipment
  - refractometers
  - vision-testing systems
- Instruments for microsurgery and ophthalmic laser surgery
- Photo coagulation equipment

Pediatric Equipment
- Monitoring equipment for fetal diagnosis
- Analyzing equipment for diagnosing different disturbances
- Ultrasonic scanning equipment for fetal diagnosis

Renal Equipment
- Home dialysis systems
- Recirculating apparatus
- Disposable dialyzers

Operating Room Equipment
- Tables

Operating Room Equipment—continued
- Lighting
- Electrosurgical units
- Microsurgical tools
- Laser surgical instruments
- Monitoring and analyzing equipment to control and measure the flow, pressure, and volume of blood including blood coagulation capacity

General Hospital Equipment
- Conventional X-ray equipment
- CAT-scans
- Ultrasonic equipment
- Linear accelerators and computer equipment for radiotherapy
- Endoscopes, both diagnostic and surgical
- Monitoring equipment
- X-ray supplies

Clinical Laboratory Equipment
- Improved conventional laboratory apparatus
- Ultraviolet spectrometers
- Automated analysis equipment
- Complex computer systems for monitoring of automated instrumentation

Miscellaneous Health Care Equipment
- Mammographic X-ray apparatus
- X-ray units for chest surveys

Disposables
- Prepared trays
- Thermometers
- Oxygen masks
- Syringes
- Urine bags
- Monitoring electrodes

Rehabitation Products
- Implantable pacemakers
- Endoprosthetic products for knee-, hip-, and arm-applications
- Artificial cardiac valves
- Wheelchairs
- Hearing aids with telephones and sound amplifiers
- Electronic and acoustic devices
- Optical readers

health sectors for conventional diagnostic equipment to study lung capacity, breathing frequency, and lung perfusion, a market also exists for such sophisticated devices as computer-based integrated lung test and analysis systems, ultrasonic nebulizers, and electronically controlled respirators. A continued, strong requirement for both positive pressure breathing equipment and stationary and mobile resuscitation units is also thought likely. Several U.S. firms—Hewlett Packard, Puritan Bennett, de Vilbliss, and Bird—vie in this competitive market segment with such third-country manufacturers as British Oxygen, Sharp, Jungner, and Jaeger.

Neurological equipment.—Imports provided two-thirds of the $1.8 million neurological equipment market in 1979, with purchases from U.S. companies totaling $400,000. Sales of U.S.-made instruments are expected to double in 1985, accounting for about one-third of imports. The expansion and modernization of health care facilities are likely to intensify the demand for neurological equipment, especially computer-based EEG-analysis systems for use in ICU's and operating rooms. The leading suppliers in this market are Philips and Siemens.

Ophthalmological equipment.—In 1979, U.S. companies supplied 41 percent of all imported ophthalmological equipment, a share that they are expected to retain in 1985. Demand for ophthalmoscopes, as well as refractometers and vision testing systems for use by paramedics, will reportedly be dominant in this market segment. At the same time, ophthalmologists at some of the large hospitals and university clinics are increasingly conducting advanced eye surgery, which is expected to create sales opportunities for devices such as laser photocoagulators.

The main suppliers of ophthalmological equipment are Welch Allyn, American Optical, and Bausch & Lomb of the United States and Heine Optotechnik of Germany.

Pediatric equipment.—Sales of U.S.-made pediatric equipment are projected to nearly double from $1.1 million in 1979 to $2 million in 1985, when they will account for 35 percent of imports and one-quarter of the total market. Equipment enjoying especially good sales prospects includes fetal diagnosis units and infant intensive care monitors and analyzers. Demand for ultrasound diagnostic equipment is also expected. Efforts to improve neonatal care are expected to stimulate requirements for resuscitation systems and incubators.

Several U.S. firms are active in the market for pediatric equipment: Air Shields, Ivac, Ohio Medical, Hewlett Packard, and Puritan. Competition comes from Medishield and Sonicaid (United Kingdom), Siemens, and Philips.

Renal equipment.—The demand for renal equipment is rising sharply, and sales are expected to more than double to $11 million in 1985, with imports accounting for about 70 percent of the market. U.S. manufacturers should retain their one-third share of the import market in 1985, selling $2.5 million worth of equipment.

Government subsidies have sparked the increased use of dialysis systems at home, which is expected to boost sales of recirculating apparatus. In addition, the demand for disposable dialyzers, which have grown more popular in the past few years, is likely to continue. The U.S. companies Travenol and Cordis Dow are strong contenders in this market, along with the Swedish firm Gambro which supplies dialysis equipment.

Operating room equipment.—Imports of operating room equipment are forecast to constitute almost three-quarters of the total market of $35 million in 1985. U.S. suppliers are expected to capture 40 percent of the import market and nearly 30 percent of the total market in 1985, achieving $10.4 million in sales. The construction of new hospitals and the improvement of existing facilities, together with the adoption of advanced surgical techniques, are seen as major stimuli in the demand for operating room equipment.

Good sales opportunities exist for anesthesia equipment, although a shortage of specialists could dampen the prospects for highly sophisticated equipment in this category. Annual purchases of approximately 30-40 new electrosurgical units are predicted, and the growing application of microsurgery should increase requirements for a variety of microsurgical instruments. Ophthalmic laser surgery is expected to be employed at some large hospitals, which will create demand for laser surgical devices. A sharp rise is anticipated in the need for operating room diagnostic equipment such as blood flow meters, blood pressure monitors, and blood volume analyzers/monitors. Sales of surgical tables and lighting systems should also do well.

Several U.S. suppliers are active in this market segment, including Ohio Medical, American Optical, Castle, Stryker, Amsco, and Ritter. The German firms Zeiss and Leitz and the British company Vickers sell microscopes. Anesthesia equipment is provided by Draeger, and BOC and Medishield (United Kingdom); Eschmann (U.K.) supplies surgical instruments, Heine (Germany) microsurgical equipment, and Matburn (U.K.) operating tables.

General hospital equipment.—Sales of general hospital equipment, which comprise one-quarter of the total medical equipment market, are expected to reach $48 million in 1985. Imports supplied about 74 percent of the market in 1979 and are projected to increase to 83 percent in 1985. U.S. suppliers should see a corresponding increase in their share of imports, from about 13 percent in 1979 to about 18 percent in 1985. Six companies reportedly dominate the supply of general hospital equipment: General Electric, Picker, and Pfizer (United States), Siemens, Philips, and Elscint.

X-ray equipment accounted for 67 percent of all sales in this product category in 1979 and is expected to account for 77 percent in 1985. Conventional X-ray equipment will be needed to equip new facilities and replace older units in existing facilities. Replacement applications will reportedly be prompted by a growing concern for radiation hazards. In addition to conventional units, some demand is anticipated for computer axial tomography (CAT) scanners for which sales reached $4 million in 1980.

In addition to the U.S., German, and Dutch companies that hold strong market positions, X-ray equipment is supplied by GEC (United Kingdom), Mitsubishi and Toshiba (Japan), and Elscint (Israel).

The use of ultrasound diagnostic equipment is

Table 5.—South Africa: Expenditures for medical equipment, supplies, and furniture by major user sectors, 1980 and projected 1985
(in millions of U.S. dollars)

	1980			1985		
	Equipment	Supplies [1]	Furniture	Equipment	Supplies [1]	Furniture
General hospitals	71.0	148.0	24.5	119.0	258.0	35.0
University medical centers	9.0	19.0	3.0	14.0	32.0	4.0
Specialized medical institutions, e.g., cancer clinics	3.0	8.0	1.0	5.0	13.0	2.0
Military hospitals	1.0	3.0	.5	2.0	5.0	1.0
Clinical laboratories	8.0	10.0	.5	12.0	17.0	.5
Mobile and permanent health care/population screening centers	7.0	6.0	2.0	14.0	10.0	3.0
Physicians (private practitioners)	6.0	9.0	1.5	8.0	14.0	1.5
Total	105.0	203.0	33.0	174.0	349.9	47.0

[1] Includes disposables.

Source: See source notation of table 1.

growing rapidly, and a wide range of applications is foreseen in both hospitals and private practitioners' offices. At present, only a few firms are active in this market segment.

With respect to therapy equipment, demand is anticipated for linear accelerators and computers for planning radiotherapy treatment. Modern endoscopes for both diagnostic and surgical purposes are also expected to be in increasing use. Currently, the Japanese firm Olympus and the German company Stortz dominate the $2 million endoscope market.

Patient monitoring systems will be needed by government-supported hospitals, while the demand for such systems in privately run facilities is likely to remain flat. Numerous companies are active in the supply of monitoring equipment: Hellige (Germany), Cambridge and Sonicaid (United Kingdom), Fukuda (Japan), Simonsen & Weel (Denmark), and Hewlett Packard (United States). U.S. exports of complete patient monitoring systems reached almost $1.4 million in 1982, 38 percent less than in 1981 but 113 percent above 1979.

Sales of X-ray supplies are expected to grow steadily at an average annual rate of more than 15 percent. Dupont and Kodak are the dominant forces in this market.

Clinical laboratory equipment.—Imports, which supplied nearly 85 percent of South Africa's clinical laboratory equipment in 1979, are forecast to slip to 71 percent of the market in 1985. U.S. suppliers, however, are expected to retain their one-fifth share of the import market over this period, accounting for $3 million of projected 1985 imports of $10 million.

The use of conventional laboratory equipment is expected to rise, creating favorable sales opportunities. Equipment used for routine analysis should have improved identification and read-out features and be designed to identify irregularities. The emphasis on enzyme analysis and related techniques is expected to stimulate demand for ultraviolet spectrometers.

Automated analyzers are also growing in importance, particularly those that offer a significant increase in efficiency. Equipment with the brightest sales prospects includes automated blood cell counters, automated sample analyzers, gamma counters, high-pressure liquid chromatographs, and computerized mass spectrometers. Because most of the automated analyzers now available have built-in microprocessors, the demand for computer systems to monitor automated instrumentation is expected to be limited.

Competing suppliers in this product category include Beckman, Coulter, Varian, Technicon, Becton-Dickenson, Gilford, Bausch & Lomb, and Corning (United States), Coulter and Cambridge (United Kingdom), Radiometer (Denmark), Shimadzu and Olympus (Japan), and Reichert (Austria).

Miscellaneous health care equipment.—Sales of U.S.-made miscellaneous health care equipment are projected to increase from $300,000 in 1979 to $1.3 million in 1985. Over this period, American companies are forecast to double their share of imports, accounting for 43 percent of imports in 1985.

X-ray mammographic equipment and X-ray units for chest surveys are expected to be in particular demand. Although mammography is not widely used at present because of initial concern about the technique, requests for mammographic units have begun to emanate from several hospitals and clinics. Both stationary and mobile X-ray units for chest surveys are expected to be in high demand at clinics and hospitals.

Disposables.—Rising labor costs, a shortage of trained personnel, and a growing concern about hygiene are expected to intensify the demand for disposables. Currently, private health care facilities are the main users of disposables, but government-supported hospitals will reportedly become important consumers in the next few years.

Although sales of disposables are forecast to more than double between 1979 and 1985, the import share of the market is expected to drop from 50 percent to 35 percent. U.S. suppliers, however, are expected to boost their share of imported equipment from 33 percent to 37 percent over this period with 1985 projected sales of $1.3 million. Specific sales opportunities are likely to be offered by prepared trays, thermometers, oxygen masks, syringes, urine bags, and monitoring electrodes.

South African suppliers of disposables include Johnson & Johnson, Kendall, Ethicon, and Smith/Nephew. U.S. companies vendors include AHSC, Becton Dickinson, Abbott Laboratories, Technicon, Portex, Stryker, and Scientific Products. Third-country competition comes from the Japanese firms Kosan, Terumo, and Feather.

Rehabilitation products.—Sales of orthotic and prosthetic equipment; architectural, transportation, and mobility equipment; physical and occupational therapy equipment; and sensory aids and adaptive systems are projected to reach $20 million in 1985. Imports are expected to account for 65 percent of the market, with U.S. firms supplying 22 percent of all imported equipment. Companies active in this market include Medtronic, Cordis Dow, Howmedica, Burdick, Stryker, and Edwards (United States).

Demand for rehabilitation products is likely to grow significantly as the Government devotes increasing attention to the handicapped. In 1980, state support was increased for equipment purchases by rehabliitation centers and individual patients.

In the orthotic and prosthetic area, demand is expected to be keen for implantable pacemakers and endoprosthetic products. Sales of mobility aids will probably be dominated by wheelchairs, while hearing aids will generate the greatest demand in the sensory aids area. Growing efforts to integrate handicapped people into society are likely to give a significant impetus to the demand for rehabilitation equipment.

Health Care System

South African expenditures for medical equipment, supplies, and furniture are forecast to reach $570 million in 1985. The general hospitals, most of which are supported by the provincial governments, are expected to account for $412 million, or 72 percent, of these purchases. Although investment in privately supported health care facilities will probably stagnate, the decline in this sector will be more than offset by the provincial Governments' planned construction of several major general hospitals.

Public-sector health care in South Africa is administered at three levels: the central Government's Department of Health; the provincial Governments; and local authorities. The Department of Health, which is charged with preventing disease and promoting health, makes all decisions on such major expansions of the health service as the construction of new medical facilities. The central Government finances most of the country's health care system, awarding block grants to the provincial administrations and the "Homelands" Health Departments.

The four Provincial Hospital Administrations (PHA's) are responsible for providing all in- and out-patient hospital services within their respective provinces. To ease the strain on urban hospital out-patient departments, so-called day hospitals have been established to provide X-ray, physiotherapy, pharmacy, and social worker services. The PHA's also finance the teaching hospitals attached to the six university medical faculties.

Finally, some 800 urban and rural local authorities provide all health services in their areas of jurisdiction. In the "Homelands," the basic unit in the health care network is the district hospital, which offers general medical, surgical, psychiatric, maternity, and quarantine facilities. In addition, community health centers provide a variety of services.

South Africa does not have a national health scheme, although several medical aid schemes meet a large proportion of medical, surgical, hospital, and nursing home costs incurred by patients. Patients in provincial hospitals are charged according to their income and number of dependents, with a flat-rate payment for all patients with an income below a given level.

Private-sector health care is provided by a variety of organizations that together operate approximately 340 hospitals and clinics. The major hospitals are run by mining companies, with the Chamber of Mines of South Africa administering 71 hospitals. Another 30 some hospitals are financed by other industrial organizations. In addition, approximately 70 private hospitals are subsidized by the PHA under whose jurisdiction they come. Finally, roughly 200 health care facilities are run on a profit-making basis.

Besides the public and private organizations that provide health care in South Africa, an independent body—the South African National Tuberculosis Association (SANTA)—operates 21 treatment centers. SANTA obtains its financing from several sources: central government grants, local authority

Table 6.—South Africa: Health care sector profile 1977 and 1980

Type of health care facility	No. of hospitals/ institutions 1977	1980	Number of beds 1977	1980
Provincial general hospitals	202	205	52,500	57,102
Private hospitals and clinics	320	273	23,900	22,125
DOH-special institutions				
Leper	1	1	495	655
Mental	18	20	16,590	15,543
Tuberculosis	5	5	2,980	2,964
Handicapped	40	42	9,050	9,561
State-subsidized institutions for handicappped	27	30	1,220	1,502
"Homelands" general hospital	68	66	19,200	18,593
"Homelands"—mental	2	2	1,930	2,500
SANTA—tuberculosis centers	24	21	4,650	4,446
Chamber of Mines hospitals	71	71	9,150	9,335
Total	778	736	141,665	144,326

Source: International Trade Administration, Office of Trade Information Services market research report.

grants, welfare organizations, charities, and voluntary contributions.

The central Government also oversees a medical research program that includes the Medical Research Council (MRC) and the South African Institute for Medical Research (SAIMR). The MRC receives approximately $10 million a year from the central Government to conduct research of national importance that is not being carried out elsewhere, and the SAIMR receives annual grants from the central Government and several public organizations to focus on the study of epidemiology. The SAIMR, which has 42 branch laboratories and a staff of more than 2,200, spends approximately $2.5 million a year on equipment and $12.5 million a year on consumable products.

In 1980, South Africa had a total of 736 hospitals and institutions with a total of 145,302 hospital beds (see table 6). Of these beds, 39 percent or 57,102 were in publicly supported general hospitals and 21 percent or 22,125 were in privately run hospitals and clinics. Three of the largest and most advanced hospitals are the Baragwanath in Soweto, the Groote Schuur in Cape Town, and the New Johannesburg. The Baragwanath Hospital, which has 2,700 beds and 20 well-equipped operating rooms, is one of the biggest specialist hospitals in the world. The Groote Schuur Hospital, with 1,410 beds and 28 operating suites, admits about 60,000 patients a year. The New Johannesburg Hospital is a new teching hospital, with five 400-bed departments specializing in obstetrics and gynecology, pediatrics, surgery, internal medicine, and disciplines such as urology, radiation therapy, and neurology.

Some 8,730 physicians are practicing in South Africa, nearly 60 percent of them general practitioners (see table 7). Approximately 1,000 doctors practice privately, but the number of private practitioners is not expected to grow because of the general shortage of doctors and the high cost of opening a private practice. In addition, a shortage of skilled medical personnel is anticipated for several years to come. Between 1977 and 1979, the number of nurses in training fell, and a shortage of trained nurses has led some provincial hospitals to reduce their number of beds. Paramedical staff, especially technicians, are said to be in short supply, as are some types of specialists, such as radiotherapists.

In the next years, many new hospitals are planned for construction and several are targeted for expansion, most of them in the province of Transvaal. Table 8 gives details of these projects.

The PHA of the Orange Free State plans to add 2,000 beds to centers such as the Welkom, Kroonstad, Sasol, and Bethlehem. The PHA of Natal plans to build a 500-bed hospital and a new teaching hospital, and the Cape Province PHA intends to construct a 2,400-bed general hospital near Cape Town and a 1,000-bed hospital at Port Elisabeth. The central government Department of Health has a 1,200-bed psychiatric hospital on the drawing board for Cape Town. Construction of new health care facilities in the private sector appears to have

Table 7.—South Africa: Number of practicing physicians, 1978

General practitioners		5,170
Obstetricians		380
Surgeons		490
thoracic	45	
plastic	20	
neuro	50	
Medicine		440
Anesthetics		430
Radiologists		380
Orthopedics		220
Pediatrics		230
Psychiatrics		180
Ophthalmologists		160
Pathologists		260
Other		390
Total [1]		8,730

[1] Approximately 1,100 of these physicians are in private practice.

Source: International Trade Administration, Office of Trade Information Services research report.

Table 8.—South Africa: Major hospital construction or expansion projects in Transvaal

Hospital	Number of beds Existing	New	Comments
Boksburg-Benoni	700	98	+ 12 for renal dialysis
Germiston	262	230	
Far East Rand	817	150	
Pholoseng		800	
Benoni		1,100	
Secunda		350	
Lenasia		400	
New Canada-Soweto		1,200	Start date 1982, cost, R 45 million
Soweto Clinics			8 new clinics, each with X-ray section, physiotherapy section, one theatre for minor operations, short-term ward with 20 beds, maternity section with 12 beds, and offices; cost R 10 million
Day Hospitals in Soweto			10 new day hospitals; cost R 20 million
Pretoria Academic		1,200	University of Pretoria, Faculty of Medicine hospital
H. F. Verwoerd	1,333		new thoracic department, new operating theater complex
Children's Hospital in Pretoria		400	
Baragwanath	2,500		new dental clinics
Kalafong	1,143	250	
Bernice Samuel in Delmas	30	35	
Elsie Ballot in Amersfoort	20	30	
Orange Free State PHA		2,000	
PHA in Natal		500	also a new teaching hospital attached to the University of Durban-Westwille
Cape Province PHA		2,400	at Mitchels Plain at Port Elisabeth
Federal Government in Pretoria		1,200	psychiatric hospital
Lesidi Clinic			private general hospital to handle everything but maternity cases; cost R 3 million

Source: International Trade Administration, Office of Trade Information Services research report.

come to a standstill, with the exception of a $3.8 million general hospital project in Soweto.

Marketing Practices

More than half the medical equipment purchased by South African end-users is obtained through agents or distributors, with most of the remainder acquired from subsidiaries of foreign manufacturers. Consequently, a good agent is considered essential to the establishment of a successful marketing operation. Agents should be bilingual (English-Afrikaans), and equipment manufacturers are advised to produce all sales literature in both languages.

The public sector purchases most of the medical equipment sold in South Africa. At the provincial level, the Transvaal is the leading end-user, accounting for 55 percent of all provincial expenditures; Cape Province is next with 20 percent.

Most end-users consider price a decisive factor in purchasing decisions. As a result, manufacturers must offer competitively priced products if they wish to capture a share of the market. In addition to price, end-users look for standardization of equipment, which they equate with efficiency and cost effectiveness. Firms offering equipment that has been approved by the South African Bureau of Standards (SABS) have a definite advantage in the marketplace, inasmuch as government groups constitute the major end-users. Other factors influencing the decisionmaking process are the cost/performance ration and the availability and quality of aftersales service and maintenance. End-users reportedly do not consider payment terms and delivery lead times to be of major importance.

Foreign firms that have achieved success in the South African market also recommend offering a complete product line within one particular equipment group, such as clinical or cardiological laboratory equipment.

Trade Regulations

No tariffs are imposed on imports of medical equipment, but the Office of State Purchases grants preference in the tendering of bids to local industry. The greater the percentage share of equipment and supplies that is locally produced or assembled, the greater the preference. Each of the four provinces also gives preference in its tender regulations to articles that are manufactured within the province. In addition, preference is given to products that comply with the requirements of the SABS.

Technical Standards

The SABS has drawn up general specifications for some items of medical equipment such as mobility aids, but it has not introduced standards for more sophisticated equipment. It does, however, advise the central DOH and the PHA's on existing specifications, and offers to test a manufacturer's claims. All nuclear medicine equipment must be certified by the South African Atomic Energy Board, and all ionizing radiation equipment must be tested for radiation leakage by the DOH's Division of Ionizing Radiation after the equipment has been installed.

U.S. manufacturers who wish to export medical equipment to South Africa should refer to Sections 378.3, 385.4(a), and Supplement 2 to Part 385 of the U.S. Export Administration Regulations. Information on exporting medical equipment can be obtained at district offices of the Department of Commerce's International Trade Administration.

U.S. Export Regulations

Some exports of medical equipment to South Africa are subject to U.S. export regulations. For information and procedures, call the U.S. Department of Commerce Exporter Service (202) 377-4811 or the Commerce ITA District Office near you. Information on South Africa can be obtained from the ITA country specialist, Urath Gibson on (202) 377-5148.

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-2988

The Survey summarizes a 80-page research report prepared by Konsulterna of Stockholm, Sweden, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Medical Equipment — South Africa," ITA 81-12-504.

Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in South Africa and trade statistics compiled by the Department of Commerce's Bureau of the Census.

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Country Market Survey

Mining Industry Equipment

South Africa

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AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The market for mining industries equipment in South Africa is expected to grow from an estimated $613 million[1] in 1981 to $993 million in 1987, an average annual growth rate of 8.3 percent (see table 1). Despite some market fluctuations over the past decade because of variations in the price of gold, continued growth of the gold mining industry and planned expansion of the coal mining industry should increase demand for a broad range of mining equipment.

Sales of mining excavating, earthmoving, and extraction machinery and equipment soared from $143 million in 1979 to an estimated $277 million in 1982, and ongoing mining projects are expected to keep demand buoyant, with an average annual growth rate above 8 percent through 1987. Much of the boost in this segment will result from the ongoing development of the coal mining industry, with strong requirements for continuous and longwall mining systems and shaft-sinking, excavating, and extraction equipment.

The market for conveying and transportation equipment has shown similar strength, rising from $155 million in 1979 to about $280 million in 1982, with 1987 sales of $421 million predicted. The planned mining of gold from depths below 3.5 km and the increasing exploitation of coal deposits should enhance sales of loading, transportation, and conveying equipment.

Acquisitions of mineral preparation and processing equipment increased steadily from $51 million in 1979 to an estimated $91 million in 1982, a trend that is expected to continue, with 1987 sales reaching $132 million. Traditional preparation and processing methods, including the autogenous grinding technique, are still used extensively in South Africa, but new demand should result from treatment of coal for export and the intention to expand in-mine processing. Although small, the market for mining exploration, prospecting, and minerals

Table 1.—South Africa: The market for mining industry equipment, 1979-80, estimated 1981-82, and projected 1987

(in millions of U.S. dollars)

	1979	1980	Estimated 1981	Estimated 1982	Projected 1987
Mining excavating, earthmoving, and extraction machinery and equipment					
Production	80	100	125	136	207
Imports	79	122	153	165	240
Exports	16	18	23	24	30
Market size	143	204	255	277	417
Conveying and transportation equipment					
Production	135	170	212	231	352
Imports	30	39	55	59	82
Exports	10	11	10	10.5	13
Market size	155	198	257	279.5	421
Mineral preparation and processing equipment and accessories					
Production	31	40	47	50	70
Imports	31	44	50	54	78
Exports	11	12	13	13.5	16
Market size	51	72	84	90.5	132
Mining exploration, prospecting, and minerals research/geochemical equipment and instruments					
Production	8	10	12	13	17
Imports	3	5	7	7.5	10
Exports	2	2	2	2	4
Market size	9	13	17	18.5	23
Total, all categories combined					
Production	254	320	396	430	646
Imports	143	210	265	285.5	410
Exports	39	43	48	50	63
Market size	358	487	613	665.5	993

Source: International Trade Association, Office of Trade Information Services, research study, The Market for Mining Industry Equipment—South Africa (see Additional Information box).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=0.84 Rand (1979), 0.80 Rand (1980), and 0.90 Rand (1981 and subsequent years). Values for years through 1980 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

research equipment is expected to grow at an annual rate of 4.5 percent through 1987 in line with stepped-up prospecting activities.

Competitive Assessment

Government tender preference for locally produced equipment and the growing expertise of the South African mining equipment industry have led to definite advances for domestic manufacturers. Their activities have progressively reduced the percentage of imports from 50 percent in 1975 to 40-43 percent in 1982. Nevertheless, in dollar terms the import market remains attractive, with foreign suppliers selling equipment worth an estimated $265 million in 1981 (see table 2), and 1987 import sales of $410 million anticipated, an annual growth rate of 7.5 percent.

U.S. suppliers dominate the import market, accounting for almost 40 percent of sales in 1981. They captured more than 50 percent of the mining excavating and earthmoving equipment import market in 1981, and also sell the largest amounts of equipment in the conveying and transportation and mining exploration and prospecting equipment categories. In the mineral preparation and processing equipment category they stand in second place behind German firms, which accounted for 34 percent of this market segment in 1981. U.K. and Japanese suppliers also offer major competition for U.S. companies.

Domestic suppliers.—South African producers of mining equipment have responded successfully to growing demand, with estimated sales reaching almost $400 million in 1981, nearly two-thirds of the total market. Government support for domestic producers is shown in import tariffs on mining equipment and tender preferences for local content in imported equipment. Joint-venture deals with foreign suppliers and production by foreign subsidiaries are responsible for a good portion of local output.

Mechanization is generally considered key in the industry, and trade experts see South African manufacturers producing much of this category of equipment. Apart from large excavating and earthmoving systems, sophisticated processing and handling equipment, and electronic equipment and instrumentation, domestic producers do handle most kinds of mining equipment. Local output has become particularly strong in mining cars, hoppers, carriages, winching equipment, and shaft-sinking equipment, especially for gold mining applications.

Almost all mining explosives and blasting accessories used are produced by AECI, a major South African chemical company. National Process Industries manufactures explosives under a U.S. license.

The South African mining equipment industry produces much of the shaft-sinking equipment and support devices in use. Manufacturers include Dorbyl (shaft steelwork), Shaft Sinkers Group (mine headgear, shaft steelwork, sinking stages, and shaft stations), H.L. & H. (mining timber in pit props), Elbroc Strata and Coalequip (roof bolts), T.H. Mining Supplies (hydraulic mine props), and Gold Fields Cementation. Older, conventional stope support systems employing timber are gradually being replaced by static rapid-yield hydraulic props, of which 130,000 are now in use. The rapid-yield barrier chock has recently been introduced for high density use within the working areas of the stope, with the back area unsupported. The Chamber of Mines supports extensive research in stope face roof support.

The market for drilling and boring equipment is dominated by local manufacturers, mostly subsidiaries of foreign companies. Drills and drilling machines are supplied by Delfos & Atlas Copco, Smith Boart, Salzgitter SA, Ingersoll Rand SA, and Compair SA. The heavier and more sophisticated equipment types, such as raise-borers and tunnel-borers, are still being imported.

Suspended or rigged thrust hydraulic drills are used extensively in South African mines because their operating speeds surpass those of pneumatic rigs, and because using electrical power avoids the inconvenience of networks of lines of pneumatic equipment. Raise-hole boring is practiced generally, and preproduction trials of blindhole boring have proved satisfactory; 15 blindhole borers are now in use, and demand is expected to grow. Tunnel boring in gold mines remains experimental. South African companies have developed their equipment jointly with Anglo-American and Goldfields, major mining companies.

Although much of the equipment used in both surface and underground coal mining is imported, local manufacturers are nevertheless taking a growing share of the market. Cutters and continuous miners are produced by Joy Manufacturing (SA), Jeffrey Mining Machinery (Dresser SA), Delfos & Atlas Copco, and Ingersoll Rand SA, supplies coal drills.

Underground coal mines tend to mechanize along U.S. lines, especially where continuous miners are used. Open pit and reserves of thin deep coal form the resources of future development. Shallow thick coal sources easily exploited by open pit and room and pillar methods are declining. Panel mining operations of coal are considered by some experts to be feasible when economies of scale beyond those afforded by present longwalling techniques are offered.

Surface mining equipment is imported or produced by foreign subsidiaries, but local content is

Table 2.—South Africa: Imports of mining industry equipment by country of origin, 1979-81

(in thousands of U.S. dollars)

	1979	1980	Estimated 1981
Mining excavating, earthmoving, and extraction machinery and equipment			
United States	42,653	67,182	78,037
United Kingdom	5,795	16,250	10,857
Japan	8,986	10,610	13,370
Germany	3,930	7,591	10,122
Other	17,346	20,123	40,959
Total	78,710	121,756	153,345
Conveying and transportation equipment			
United States	11,827	15,885	18,488
United Kingdom	4,739	6,680	10,211
Germany	4,521	5,062	6,270
Japan	2,509	4,059	6,454
Other	6,865	7,627	13,839
Total	30,461	39,313	55,262
Mineral preparation and processing equipment and accessories			
United States	3,630	5,300	6,350
United Kingdom	3,510	5,100	5,900
Germany	10,316	14,700	16,900
Japan	1,514	2,800	3,100
Other	12,390	15,800	17,500
Total	31,360	43,700	49,750
Mining exploration, prospecting, and minerals research/geochemical equipment and instruments			
United States	1,000	1,500	2,000
United Kingdom	620	800	1,000
Germany	600	800	800
Japan	400	700	800
Other	680	1,500	2,800
Total	3,300	5,300	7,400
Total (all categories combined)			
United States	59,110	89,867	104,875
United Kingdom	14,664	28,830	27,968
Germany	19,367	28,153	34,092
Japan	13,409	18,169	23,724
Other	37,281	45,050	75,098
Total	143,831	210,069	265,757

Source: See source notation of table 1.

increasing, giving local manufacturers more scope. Domestic companies include Galion Dresser SA, producing motor graders powered by locally made diesel engines; Blackwood Hodge SA, manufacturing haulers, loaders, scrapers, and crawlers; and Hubert Davies, with a 70-percent local content in its Wabco graders.

South African manufacturers dominate the market for conveying and transportation equipment, with approximate sales of $212 million in 1981 in a total market of $257 million. Over the past 10 years, the industry has become increasingly skillful and has gained particular strength in locally designed winching and winding equipment and mine vehicles such as cards, hoppers, and carriages. Local suppliers capable of manufacturing total finished units or equipment with significant local content include Salzgitter SA (loaders for gold mines), Premier Metal SA (loaders, load-haul-dump (LHD) units, and cranes), Gallion Dresser SA (mobile cranes), Hubert Davies (the underground Wagner LHD, Goodman electric locomotives, Goodman gathering arm loaders), Dorbyl Railway Products (hopper wagons, mine cars, locomotives), JCI General Engineering (a broad range of hoppers, trucks, mine cars, and man carriages), Asea Electric SA (mine cars, elevators, hoists, and winders), Dunlop SA (conveyor belt products), SA Canvas Co. (conveyor belting), and Joy Manufacturing SA (winders). Output and product quality are considered good.

About half of the demand for mineral preparation and processing equipment is met by domestic suppliers, which produced milling and crushing machines and filtering and reduction and other equipment worth $40 million in 1980. Leading companies, including Dorbyl/Vecor Heavy Engineering, Barlows Heavy Engineering, Nordberg Manufacturing SA, Joy Manufacturing SA, James Brown & Hamer, and FMC SA, produce a range of crushing equipment, ball and rod mills, coal-preparation equipment, agitators, dust equipment, feeders, washing and screening plants, and classifiers. Most of this equipment is manufactured according to U.S. or European designs, and product technology is considered high. In many cases, however, local manufacturers have modified designs and technology to suit local conditions, particularly in gold mining.

Domestic companies produced an estimated $12 million of exploration and prospecting equipment in 1981, representing about 70 percent of the market. Some equipment is made under U.S. or European license. Manufacturers include Geophysical Instrumentation, which produces measuring and control instruments and survey equipment; Thorn SA, measuring and control, detection, testing, and sorting equipment; Protea Laboratory Services and Protea Physical and Nuclear Instruments, measuring and control instrumentation and reagents, and Delfos & Atlas Copco and Compair SA, prospecting and exploration drilling equipment.

U.S. suppliers.—In 1981 sales by U.S. firms reached about $105 million in the import market; they are expected to account for about 42 percent of the 1987 import market with sales of $170 million. The ability of U.S. companies to offer high-quality products and innovative designs, coupled with a general pro-U.S. attitude and longstanding ties with end users, has enabled them to maintain their position as the dominant foreign suppliers of mining equipment for South Africa. The trend toward increased mechanization of mining operations, particularly for coal, and plans to work gold at greater depths are also expected to favorably affect U.S. interests. The high opinion of South African end users is maintained by the productivity-raising and labor-saving features of U.S.-made equipment and suppliers' ability to establish good stocks of spares and offer maintenance and repair facilities. On the other hand, U.S. firms' prices tend to be higher than those of most competitors.

U.S. suppliers have been moderately successful in sales of shaft-sinking equipment and support devices, and their position is especially strong in drilling and heading equipment and drills and equipment for both surface and underground coal mining. Good sales of conveying, loading, and hauling equipment, movable systems, rail-type equipment, and trackless equipment are also reported. In all other categories of equipment, the marketing situation of U.S. firms remains fair (see table 3).

Third-country suppliers.—Third-country suppliers are active in all segments of the import market. Particularly stiff competition to U.S. firms is offered by West German and British companies, which in 1981 accounted for about 13 percent and 10 percent, respectively, of mining equipment import sales in South Africa. German suppliers are especially strong in mineral preparation and processing equipment. Despite reported communications difficulties, Japanese firms are enjoying definite successes, accounting for about 9 percent of the import market in 1981.

Major German suppliers of reportedly high-quality excavating and earthmoving equipment include Mannesmann Demag (excavators and earthmoving equipment), Klockner Becorit (drills and roof bolters), and Paurat (tunnel borers). The Japanese companies of Komatsu and Hitachi offer earthmoving and excavating equipment. Scandinavian representation in this segment is restricted to drills sold by Atlas Copco (Sweden) and excavators sold by the Norwegian firm of Broyt. Poclain (France) supplies excavators.

German firms are also active in the conveying and transportation equipment segment of the market. Salzgitter sells loaders, and Klockner Becorit has supplied several rail-transportation and conveyor systems. The British Leyland company has enjoyed success with sales of components for mining tractors and trucks and other U.K. suppliers offer conveyors and elevators. Japanese interests are represented by Yamakuya, Okumura, and Densha, offering cranes, lifts, and hoists. Linden Alimak, Flygt, and Hagglunds, all Swedish firms whose products are highly regarded, supply cranes, pumps, and lifts. Poclain also offers cranes and mechanical shovels, and tractors and crawlers come from Fiat of Italy.

In mineral preparation and processing equipment, the West German firms are the frontrunners: PHB Weserhutte for blending and processing plant equipment, Buhler Miag for mills and ore-handling equipment, and Humbolt Wedag for crushers, feeders, mills, and sorting machines. Japanese firms have also made some inroads in this market segment in recent years.

Among the third-country suppliers of mining equipment, none appears to be favored through special trade agreements. European firms do offer convenient training opportunities for South African technicians, however.

Table 3.—South Africa: Analysis of the market for selected mining equipment

Major products/production	Market for U.S. equipment	Competition	Principal competitor (countries)
Mining excavating, earthmoving, and extraction machinery and equipment			
Blasting accessories	Fair	Strong	Domestic
Mine shaft-sinking equipment and support devices	Fair	Strong	Domestic
Drilling and heading equipment drills	Good	Strong	Domestic, Sweden, Germany
Coal mining underground	High	Strong	Domestic, United Kingdom, Germany
Open pit/surface	High	Strong	Domestic, United Kingdom, Germany, Japan
Conveying and transportation equipment			
Conveying, loading, and hauling equipment	Good	Strong	Domestic, Germany, United Kingdom
Movable systems	Good	Strong	Domestic, Germany, United Kingdom
Conveyor parts and accessories	Good	Strong	Domestic, Germany, United Kingdom
Shaft winding equipment	Fair	Strong	Domestic, Germany
Cranes and booms	Fair	Strong	Domestic, France, Germany
Winches and hoists	Fair	Strong	Domestic, Germany
Aerial ropeways	Fair	Strong	Domestic, United Kingdom
Elevators	Fair	Strong	Domestic, Japan, Switzerland
Rail-type equipment	Good	Strong	Domestic, Germany, United Kingdom
Trackless equipment	Good	Strong	Domestic, Germany
Winding components	Fair	Strong	Domestic, Germany, United Kingdom
Ancillary equipment and components	Fair	Strong	Domestic, Germany, United Kingdom
Mineral preparation and processing equipment and accessories			
Basic processing equipment and accessories	Fair	Strong	Domestic, France, United Kingdom, Germany
Crushing equipment	Fair	Strong	Domestic, Germany, United Kingdom, Italy
Screening equipment	Fair	Strong	Domestic, Germany, United Kingdom, France
Classifiers	Fair	Strong	Domestic, Germany
Dewatering equipment	Fair	Strong	Domestic, Germany, Italy
Washing equipment/scrubbers	Fair	Strong	Domestic, Germany, United Kingdom
Kilns and furnaces	Fair	Strong	Domestic, Germany, United Kingdom
Feeders	Fair	Strong	Domestic, Germany, United Kingdom, Japan, Sweden
Dryers	Fair	Strong	Domestic, Germany, United Kingdom Italy
Vibrating, shaking equipment	Fair	Strong	Domestic, Germany, United Kingdom
Separators, other	Fair	Strong	Domestic, Germany, Sweden
Heating and cooling equipment	Fair	Strong	Domestic, Germany, Sweden
Dust equipment	Fair	Strong	Domestic, Germany, United Kingdom Sweden
Mixing and blending equipment	Fair	Strong	Domestic, Germany, United Kingdom
Grinding mills	Fair	Strong	Domestic, Germany, United Kingdom, Italy
Mining exploration, prospecting, and minerals research/geochemical equipment and instruments			
Exploration	Fair	Strong	Domestic, Germany, United Kingdom
Area research and exploration drilling	Fair	Strong	Domestic, Sweden, United Kingdom
Prospect drilling	Fair	Strong	Domestic, Sweden, United Kingdom
Ancillary prospecting	Fair	Strong	Domestic, Germany, Italy
Geophysical equipment for geological resources	Fair	Strong	Domestic, Germany
Geological tools	Fair	Strong	Domestic, Germany
Geochemical equipment/laboratory analytical	Fair	Strong	Domestic, Germany, United Kingdom, Japan

Source: See source notation of table 1.

The Mining Industry

The world's largest known deposits of gold, platinum, chromium, manganese, vanadium, and fluorspar are found in South Africa, as are significant reserves of antimony, asbestos, coal, copper, diamonds, iron ore, phosphates, uranium, and zinc. The mining industry, therefore, plays a major and increasing role in the country's national economy: In 1980 the value of mineral sales exceeded $15 billion, making up some 23 percent of the country's GDP, compared with 10 percent in 1970. When mining industry earnings are calculated together with indirect effects on the economy, about 40 percent of GDP is attributable to this industry.

South Africa's enormous mineral reserves make it closer than any other country to mineral self-sufficiency; crude oil, bauxite, and coking coal remain the only significant mineral imports. Moreover, this country provides strategic minerals to the free world, whose primary sources for many minerals are South Africa and the U.S.S.R. Upwards of 90 percent of mining industry earnings accrue from exports, including the greater bulk of precious metal, diamond, copper, chromium, manganese, uranium, asbestos, fluorspar, and phosphate output (see tables 4 and 5).

Iron ore and coal constitute an important factor in South Africa's industrial growth, with 82 coal mines and 10 iron ore mines supplying the steel industry (see table 6). In 1980 ferrous-alloy metallurgy produced 16 million tons of output using superior grade iron ore. The steel industry uses more than 6 million tons of coal each year, largely as blast-furnace coke. Shortages of coke have prompted development of a large open-pit operation to produce blend coking coal, and plans are in hand to develop prime coking coal deposits in the Transvaal. Attempts are also underway to make up the shortfall of coke by using direct reduction methods so that the steel industry can utilize domestic noncoking coal. In addition, this coal is being increasingly used for synfuel and chemical applications.

The South African mining industry is dominated by seven private companies: Anglo-American, De Beers, General Mining and Union Corporation (Gencor), Goldfields of South Africa (GFSA), Johannesburg Consolidated Investments (JCI), Anglovaal, and Rand Mines. Through interlocking cross-shareholding, these companies largely control most mining activities in the country. Anglo-American produces about 40 percent of the country's gold and uranium, and GFSA accounts for about a quarter of South Africa's gold. JCI also holds gold interests, together with uranium, platinum, antimony, and some base metals. Anglovaal has large holdings in a broad range of minerals, including gold, uranium, copper, zinc, iron ore, and antimony. Rand Mines' chief interests are gold, uranium, coal, and chromium. Gencor is a major source of coal; other operations of the company cover gold, uranium, copper, asbestos, chromium, and manganese. De Beers holds a monopoly in diamond production.

Government participation in the mining industry is negligible and the Government does not directly control mining operations. However, mining rights for precious metals and stones and natural oil are granted by the state in the form of agreements registered with the Mining Titles Regulation Office at the Department of Mineral and Energy Affairs. Written permission is required to mine for uranium, and the right of prospecting for oil and min-

Table 4.—South Africa: General mineral production, 1971, 1976, estimated 1981, and projected 1986 and 1990

Commodity	Unit	1971	1976	1981	1986	1990
Metallic minerals						
Gold	kg	976,000	713,000	672,000	725,000	650,000
Silver	kg	92,000	89,000	97,000	105,000	110,000
Platinum	kg	58,000	64,000	70,000	72,000	75,000
Iron	tons	9,200,000	15,600,000	26,300,000	30,000,000	32,000,000
Copper	tons	165,000	197,000	200,000	200,000	200,000
Antimony	tons	23,000	18,400	22,400	20,000	25,000
Chromium	tons	1,800,000	2,410,000	3,430,000	3,500,000	3,600,000
Manganese	tons	5,600,000	5,500,000	5,700,000	5,800,000	5,900,000
Uranium	tons	—	3,400	6,700	5,500	5,000
Zinc	tons	115,000	150,000	177,000	180,000	180,000
Nonmetallic minerals/rock products						
Asbestos	tons	34,000	370,000	265,000	250,000	240,000
Diamonds	carats	6,800,000	7,623,000	8,600,000	9,000,000	9,200,000
Fluorspar	tons	140,000	290,000	504,000	530,000	550,000
Phosphates (ores and concentrates)	tons	15,200,000	17,800,000	19,500,000	22,500,000	24,000,000[1]
Gypsum	tons	410,000	482,000	440,000	400,000	400,000
Coal	tons	53,000,000	76,000,000	125,000,000	175,000,000	220,000,000

Source: South African Yearbook 1980/81, South African Mining and Engineering Yearbook 1981, and International Trade Administration, Office of Trade Information Services, research study, The Market for Mining Industry Equipment—South Africa.

[1] Long-range projections of coal production are considered difficult to forecast according to the U.S. Consulate at Johannesburg. Diverse sources provide wide variances for the 1990 production outlook.

Table 5.—South Africa: Exports of important minerals, 1979-82 and projected 1987

Commodity	Unit of export	1979	1980	Estimated 1981	Estimated 1983	Projected 1987
Metallic minerals						
Gold	kg	690,000	660,000	652,000	670,000	708,000
Silver	kg	89,000	91,000	90,000	92,000	100,000
Iron	tons	14,600,000	14,500,000	14,700,000	15,100,000	15,800,000
Copper	tons	121,000	120,000	118,000	112,000	120,000
Antimony	tons	11,400	3,300	10,500	11,000	11,000
Chromium	tons	985,000	1,200,000	1,350,000	1,400,000	1,700,000
Manganese	tons	4,000,000	4,400,000	4,200,000	4,300,000	4,100,000
Uranium	tons	4,900	5,700	5,400	5,300	4,400
Zinc	tons	37,000	26,000	27,000	29,000	35,000
Platinum	kg	64,000	66,000	67,000	67,000	70,000
Nonmetallic minerals						
Asbestos	tons	260,000	255,000	250,000	253,000	235,000
Diamonds	carats	8,100,000	8,400,000	8,000,000	8,400,000	8,800,000
Fluorspar	tons	410,000	243,000	434,000	445,000	490,000
Phosphates	tons	14,500,000	15,700,000	16,700,000	17,000,000	18,600,000
Gypsum	tons	3,200	1,200	2,520	2,600	3,000
Coal	tons	23,000,000	27,000,000	30,000,000	32,000,000	50,000,000[1]

Source: South African Yearbook 1980/81, South African Mining and Engineering Yearbook 1981, Financial Mail: Mining 1981, and International Trade Administration, Office of Trade Information Services, research study, The Market for Mining Industry Equipment—South Africa.

[1] See note on Table 5.

ing and disposing of precious metals and oils is vested in the state; rights for other minerals are vested in the holder of the rights to base metals on a given tract of land. South African nationals and foreigners have equal claim to prospecting and mineral rights.

Major government organizations involved in mining industry commercial affairs include the Department of Mineral and Energy Affairs; the Government Mining Engineer's Office, concerned with safety and health and environmental matters; the Registrar of Mining Titles, which administers the most important mining rights; the Minerals Bureau, which acts in an advisory capacity for government minerals policy; and the Chamber of Mines, whose functions are to represent the mining producers, act as the mining employers' organization, and conduct research and trials for deep-level mining.

Commodity Analysis

Gold.—With estimated reserves of 16,500 tons, or about 50 percent of total world reserves, gold will remain South Africa's major export earner. In 1981 total revenues from the 672,000 kg of gold mined reached $9 billion, equivalent to 74 percent of all earnings from the mining industry and indirectly accounting for an estimated 30 percent of GDP. The bulk—652,000 kg—was exported in 1981, and projections indicate steady increases in both production and exports through 1987, when exports are expected to top 700,000 kg.

South Africa's gold fields stretch across a 480-km tract through the Transvaal and Orange Free State (OFS), and mining is being conducted at depths down to 3.5 km. The reserves are known to run even deeper, but exploitation will depend on improvements in technology and the development of the gold market, which exerts a major influence on mining policies. In the decade through 1980, soaring gold prices led to enormous broadening of the gold-mining industry, with openings of new mines and mining of lower grade ores and retreatment of sand and slime residues. The industry has an anticipated commitment through 1987 to a $7 billion program to expand existing mines and develop untapped reserves for selected projects. (see table 7). Nevertheless, industry executives indicate that most expansion programs will be completed, although the timing will be subject to periodic review.

Coal.—Production of coal, the major growth industry in South Africa, is predicted to rise from 125 million tons in 1981 to 175 million tons in 1986, and to soar much higher in the long term. In 1980, earnings from coal sales reached $1.5 billion, including $700 million from exports. Foreign earnings from coal far exceed those from diamonds, and coal could eventually become even more valuable than gold for the South African economy.

A study by the Deparment of Mineral and Energy Affairs now sets the country's extractable reserves of bituminous coal at 51 billion tons. Currently, coal production takes place mainly in the Transvaal Highvold, Northern OFS, and Northern Natal. Most deposits are found in relatively thick seams, and more than half lie at depths of less than

Table 6.—South Africa: Number of mines and annual output of selected minerals, 1980

Mineral	Annual output	Number of mines
Gold	>50,000 kg	1
	30-50,000 kg	7
	10-30,000 kg	13
	<10,000 kg	26
		47
Coal	>3 m tons	6
	1-3 m tons	20
	<1 m tons	56
		82
Asbestos	>50,000 tons	1
	20-50,000 tons	7
	<20,000 tons	11
		19
Chromium	>500,000 tons	2
	100-500,000 tons	6
	<100,000 tons	8
		16
Copper	>100,000 tons	1
	50-100,000 tons	—
	<50,000 tons	4
		5
Diamonds	>2 m carats	2
	1-2 m carats	4
	500,000-1 m carats	12
	<500,000 carats	33
		51
Fluorspar	>200,000 tons	1
	100-200,000 tons	3
	<100,000 tons	2
		6
Iron ore	>5 m tons	1
	2-5 m tons	3
	<2 m tons	6
		10
Manganese	>1 m tons	1
	0.5-1 m tons	6
	<0.5 m tons	15
		22
Phosphates	>500,000 tons	1
	100-500,000 tons	2
	<100,000 tons	1
		4
Uranium	>1,500 tons	1
	500-1,500 tons	2
	<500 tons	6
		9

Source: Mining Annual Review and SA Mining and Engineering Yearbook 1981.

100 meters, factors that make exploitation easy and costs low compared with world coal prices. The Government predicts 6 percent annual production growth over the next 40 years, and significant expansion programs are now being initiated by the country's main coal producers, Amcoal, Gencor, and Rand Mines.

Indicative of the coal industries foreseen growth are South Africa's export allocations which imply industry expansion projects particularly for processing plants to beneficiate coal for export. The export allocations are believed to require approximately $1.5 billion in new investment over the next decade. Among the preliminary allocations which are understood to be subject to final negotiations are:

—Amcoal 4 MT/A[1]
—Trans Natal (Gencor) 4 MT/A
—Anglovaal 1 MT/A
—Gold Fields 1 MT/A
—JCI 1.5 MT/A
—Rand Mines 2.5 MT/A
—Transvaal Coal Owners 1 MT/A
—Clydesdale (Gencor) 1 MT/A[2]
—Shell 500 KT/A (ths tons per yr.)
—BP 500 KT/A
—Messina Transvaal Development 500 KT/A
—Severin Minerals Corp. 450 KT/A
—Grinaker 500 KT/A
—Gencor 500 KT/A
—Diamonds & Grant 200 KT/A
—Toulana 250 KT/A
—Duiker Exploration 500 KT/A
—Kangra 500 KT/A

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[1] Million tons/year

[2] Thousand tons/year

Under the terms of allocation exports would begin in 1986. Therefore work on new mines to supply export coal will be started in 1983.

Much of the coal produced is sold locally, mainly for the electricity-generating sector. By 2000, some 65 percent of coal output is expected to be used to generate electricity, with perhaps another 20 percent used for the increasingly important synfuel applications and the chemical industry.

Diamonds.—South African diamond production— the world's third largest—reached an estimated 8.6 million carats in 1981, with 8 million carats exported. Steady growth is predicted, with 1986 production rising to 9 million carats.

The state-owned alluvial diggings in the Northwestern Cape represent an exception in De Beers' monopoly control of South Africa's diamond mining industry, which is concentrated in some 50 active mines. All output from the deposits near Kimberley, outside Pretoria, and in Namaqualand is sold through the De Beers-controlled Central Selling Organization in Kimberley. This close-knit structure controls diamond sales locally and worldwide, but increasing production in the U.S.S.R. and Australia threaten to break De Beers' traditional hold on the world diamond market.

Other minerals.—South African iron ore reserves are substantial, with an estimated 100,000 metric tons of hematite, worked mainly in the Northern Cape and Transvaal. In 1981 exports earned $218 million. Further increase in foreign

Table 7.—South Africa: Partial list of mining industry investment projects (current or under consideration)

Commodity	Company	Location	Project
Gold	Anglo-American	Western Deep Levels	New 3,900 meter shaft
Gold	Anglo-American	Western Deep Levels	Gold-processing plant mill capital 160,000 tons per month
Gold	Anglo-American	Erfdeel/Danbaarheid	Field development
Gold	Anglo-American	Free State Geduld	New shaft ("No. 5")
Gold	Anglo-American	Free State Geduld	Expansion of mill capacity to 425,000 tons per month
Gold	Anglo-American	N/E Free State Geduld	New shaft system
Gold	Gencor	Beatrix Mine, Orange Free State	Development
Gold	GFSA	North Driefontein	Deposit development
Gold	GFSA	Doornfontein	Mine development
Gold	GFSA	Libanon Mine	New shaft
Gold	OCI	South Roodepoort	New mine
Gold	Rand Mines	ERPM mine	Mine expansion
Gold	Rand Mines	Crown Mines	Dump retreatment
Gold	Rand Mines	City Deep	Mine reopening
Gold	Anglovaal	Rand Lease Mine	Mine reopening
Uranium	Gencor	Beisa Mine, Orange Free State	Carbon-in-pulp process (treatment plant)
Uranium	Anglovaal	Harthbeesfontein	Treatment plant expansion
Uranium	OCI	Western Areas	Treatment plant
Coal	Anglo-American	New Denmark	New mine
Coal	Anglo-American	New Vaal	New opencast mine
Coal	Anglo-American	Kleinkopje	Mine expansion
Coal	Anglo-American	Goedehoop	Open-pit mine development
Coal	Gencor	Matla	Mine expansion
Coal	Gencor	Optimum Mine	New opencast pit
Coal	Gencor	Hlobane Mine	Mechanization, new coal preparation plant
Coal	Gencor	Kwa Ngoma Mines	Anthracite mine opening
Coal	Gencor/Total BP	Ermelo Mine	Mine expansion
Coal	BP	Middelburg	Opencast mine development/ washing plant
Coal	Rand Mines	Duva Mine	Mine expansion
Coal	ISCOR	Grootegeluk	Coking mine opening, conveyor system
Coal	SASOL	Bosjesspruit and Sigma Mines	Mine mechanization
Coal	Gencor/Trans Natal/ Sentrachem Consortium	Springbok Flats	Surface and underground mine development, liquefication plant
Coal	Anglovaal/Anglo Alpha/Caltex Consortium	Witbank	Deposit development

Source: See source notation of table 1.

Table 7.—South Africa: Partial list of mining industry investment projects (current or under consideration) (cont.)

Commodity	Company	Location	Project
Diamonds	De Beers	Finsch Mine	New 760 meter shaft
Iron ore	Phelps Dodge	Northern Transvaal	Development of new deposit
Copper	Rio Tinto	Palabora Mine	Mine extension
Platinum (Group)	Lonrho	Western Platinum Mine	New exploration
Copper	O'okiep		Expansion
Phosphate	Foskor	Palabora	Mine expansion, pilot plant construction

demand can be met through the completion of the Saldhana Harbor improvements.

Copper is mined at Prieska, Messina, O'okiep, and Palabora, and selected expansions are under development or anticipated. More than 80 percent of the world's platinum comes from South Africa, with the three main producers, Rustenburg, Impala, and Western, accounting for most of production. Slow expansion is being used to control supply.

Very large deposits of manganese and chromium occur in South Africa. Chromium deposits are found in the Bushveld Igneous Complex in Northern Transvaal and are extracted using inexpensive shallow underground methods. Manganese is recovered from the Postmansbury Field and the massive Kalahari Field, which lends itself well to mechanized mining. No major production expansion is envisaged for either of these two metals.

South Africa has the world's largest reserves of fluorspar and ranks as the world's second largest supplier. Most production takes the form of acid grade as feedstock for the production of electrolytes in the aluminum industry, and the mineral is also used in beneficiation of steel and in the chemical and ceramics industries. Barlow Rand and Gencor dominate this industry. Phosphate deposits are worked by the state-owned Foskor in the Eastern Transvaal, making South Africa self-sufficient in its farming sector needs and enabling the export of phosphoric acid and phosphate fertilizers. Consolidated Murchison operates seven antimony mines in the Northern Transvaal.

Market Access

Marketing practices.—Most South African purchases of mining equipment are handled through an open-tender system. This has long been the traditional method employed by the mining houses which anticipate no change. However, the buyers do have their preferences and are considered quite conservative in their attitudes both toward equipment and toward its suppliers; they tend to deal with known suppliers and use tried-and-tested equipment.

Purchasing decisions are now made jointly by on-site managers and chief buyers at head offices in Johannesburg. Sales promotions ideally start at the offices on mine sites. Cost is always a critical decision factor; other elements are now becoming more important: availability of aftersale and engineering services, locally maintained inventories or readily accessible spare parts, and reasonable delivery times. All of these factors are viewed by South African buyers as providing and maintaining a significant international competitive edge.

Foreign firms are advised to establish their own local sales organization employing the services of a local agent. Since many purchasers speak Afrikaans, agents should be bilingual to properly represent their clients' interests. Qualified local agents form the most important link in the distribution network. Some 60 percent through distributors, including the South African subsidiaries of foreign companies. Other purchases are made directly by end users or mining contractors.

No difficulties need be anticipated in procuring the services of a good agent in Johannesburg. Attention to the selection and appointment of the proper outlet, especially agents, is crucial. Some manufacturers' representatives reportedly handle competing lines, due in part to the marketing system. Close cooperation with and assistance from the principal are expected. Promotional costs are shared and good, up-to-date product literature printed in both English and Afrikaans should be supplied to agents.

Trade restrictions.—Imported mining industry equipment attracts rates of duty varying between 3 and 27 percent. Details can be found in the Customs and Excise Tariff Book. In some cases, machinery, apparatus, and appliances may be imported free of customs duties. Shippers may contact the Office of African Affairs in the U.S. Commerce

Dept. for guidance on tariffs. In addition to import tariffs, preference is given in government tenders to local products in the form of local-content discount of 1 percent to 10 percent on imports. In addition to the local-content preference, an additional preference of no more than 15 percent of the bid price may also be added. However, because of the Government's minimal involvement in the industry, preferences do not usually seriously affect tenders from foreign firms, with the possible exception of comparable products with local content.

Standards.—Equipment manufactured to U.S. standards is usually acceptable in South Africa. Mining industry equipment manufacturers are encouraged to check with the Government Mining Engineer's office, Johannesburg, regarding safety and health factors. Additionally, U.S. suppliers may wish to contact the South African Bureau of Standards (SABS) regarding requirements for approval or award of the SABS mark. This mark will probably be a factor in decisions on purchases of equipment for which comparable local items are available. Information on testing advanced types of equipment, especially machinery and other products used in gold and coal mines, may be obtained from the Chamber of Mines of South Africa, Johannesburg.

Additional Information

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The Survey summarizes a 78-page research report prepared by Konsulterna AB, 11151 Stockholm, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230

The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications.

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Country Market Survey

Medical Equipment

Zimbabwe

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nternational Trade Administration

After undergoing a brisk post-war recovery, Zimbabwe has been hard hit by depressed export markets, inflation and drought. Real growth was only around 2 percent in 1982 and less in 1983. Late in 1982, the Government devalued the Zimbabwe dollar, cut back import allocations, froze wages and decided to reduce spending on the 1982/83 budget. Zimbabwe's trade deficit has led to international borrowing, as foreign aid was not sufficient to meet the shortfall, and an agreement was concluded with the International Monetary Fund to carry the country through its short term debt peak. Nevertheless, Zimbabwe remains one of Africa's strongest and most diversified economies and in good position to take advantage of the world economic recovery. While the health budget was not expected to increase this year, the need for better health care facilities and provision of health services to rural areas will continue to receive priority attention from the Government, foreign donors and international organizations.

The market for medical equipment in Zimbabwe is thus expected to reach \$5 million[1] by 1986 (see table 1). The Government has embarked on a substantial effort to serve the health care needs of its people, mainly through expansion of rural health care and the building or rehabilitation of over 300 clinics and new district hospitals in the near term. Much of the importation of equipment will be for these facilities and will be basic and low cost, consisting of \$3.5 million worth of mechanotherapy and respiratory devices; \$300,000 for orthopedic appliances, prostheses, hearing aids, pacemakers, and such; and \$1.2 million worth of X-ray apparatus.

Competitive Assessment

Domestic production of medical equipment is limited to basic orthopedic equipment. Therefore, U.S. manufacturers will face competition only from one another and exporters from other nations; no prospect of meaningful competition from local manufacture is foreseen.

Table 1.—Zimbabwe: Market for medical equipment, 1979-80 and projected 1986
(in thousands of U.S. dollars)

	1979	1980	1986
Medical/surgical, electromedical, diagnostic, ophthalmic apparatus, and mechanotherapy and respiratory appliances (90.17-90.18)	2,348	2,452	3,500
Orthopedic appliances, prostheses, hearing aids, pacemakers, and so forth (90.19)	196	172	300
X-ray apparatus (90.20)	1,176	841	1,200
Combined total	3,720	3,465	5,000

Note: Market is supplied entirely by imports.

Source: Central Statistical Office, Ministry of Health, and International Trade Administration, Office of Trade Information Services research report (see Additional Information box).

The major thrust of expenditures is for rural health facilities; thus, toward simpler items of equipment. Specifically, the products which seem to offer the greatest potential are disposables, ventilators, defibrilators, catheters, electrocardiographs (EEG's), X-ray equipment and film (which must be simple, with static condenser discharge models preferred), blood bags, autoclaves, boiling sterilizers, urinary appliances, diagnostic sets (basic), surgical instruments, anesthesia equipment, and sphygmomanometers.

Britain, West Germany, Japan, South Africa, and the United States are the major sources of medical equipment in Zimbabwe (see table 2). The U.S. share has been, and is expected to remain, at about 20 percent. However, most purchases are made through agents, and this accounts for great volatility in selection of suppliers. At present, strong preference remains in some quarters for importation of goods from Britain, but this preference is diminishing. Major criticisms center around high prices, slow delivery and (in some cases) lack of interest in supply. Germany and Japan are favored by many who see items from these two countries as not only of high quality, but also highly competitive. Goods from the United States are thought by some to be overpriced, and complaints are heard over slow delivery. Most important, some suspicion exists that output from America is too sophisticated for the rather basic needs of Zimbabwe.

Actually, the major suppliers to Zimbabwe are in South Africa; but the bulk of items from this nearby nation are either reexports or manufactured under license. Pakistan had provided substantial amounts of cheap surgical instruments; however, these are felt to be of inferior quality. At present, little evidence of activity has been detected from Eastern bloc nations.

The major present suppliers of **cardiology equipment** are the U.S. firms Hewlett Packard and Coulter for ECG's, Burdick for defibrillators and monitoring equipment, and USCI for catheters; third country suppliers include M.G. Electronics of Israel and Datascope (Netherlands). **Pulmonary apparatus** is supplied by Veriflo, Datascope, Sarns, Brunswick and Travenol of the U.S. Arrow and Downs of the United Kingdom supply ventilators, M.G. Electronics (Israel) is also active in this sector. **Ophthalmological equipment** is provided by Welch-Allyn of the U.S. (diagnostic sets), S.S.C. of Switzerland and the British firms Keeler (instruments, diagnostic sets) and Downs (special operations instruments). Zeiss of Germany is strong in ophthalmoscopes. **Neurological equipment** is supplied by Aesculap of West Germany (instruments) and Downs (instruments). **Pediatric equipment** comes from K.T.K. of Japan (incubators), Bourns and Marco of U.S. (ventilators and incubators) and Aesculap. **Renal equipment** is provided by Baxter Travenol, Downs (cystoscopes), Dylade (kidney machines) and Avon Medical of the United Kingdom (accessories for renal units). **Operating room** instruments come from Medicon, operating tables and operating room equipment from Eschman (South Africa), anesthesia equipment from Draeger (West Germany), and BOC Medishield (United Kingdom). **General hospital equipment** such as X-ray machines is supplied by Siemens. DuPont (United States) and Agfa (West Germany) sell X-ray film.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following rate: US\$1 = 0.719 Zimbabwe dollar.

Major suppliers of **disposables** are Gillette, Heinke and Sanitex. **Clinical laboratory** suppliers include Hyland (United States), Pharmacia (Sweden), Baird and Tatlock (United Kingdom) and Philip Harris (United Kingdom). **Orthopedic and prosthetic equipment** comes from such firms as Zimmer of the U.S. (hip prostheses) and Spenco (breast prostheses).

Major expenditures for new sophisticated equipment will be infrequent. In 1979, an X-ray and scanning unit for the main hospital in Harare (formerly Salisbury) was purchased at a cost of over $1 million and Zimbabwe's first national cancer center was recently built in Harare. However, in the short- to medium-term, outlays will be geared to the needs of rural clinics and new district hospitals. The estimated equipment outlay for each of the latter is $1.7 million and includes X-ray equipment, operating room equipment and instruments, and ECG machines. Purchases for the rural clinics will be even more simple, confined to diagnostic sets, basic sterilizers, and gas/battery or solar powered refrigerators.

Health Care System

Most health care is provided by the central government through the Ministry of Health. In terms of expenditures, this is the key sector of the system with a total 1983/84 budget of $172.1 million, up from $106.7 million in 1980/81 and $63.4 million in 1978/79. Other ministries of the central Government provide health care and financing; the Ministry of Agriculture is responsible for the control of zoomotic diseases, the Ministry of Labour and Social Services deals with welfare of indigents, rehabilitation and occupational health, the Ministry of Works (construction) builds and maintains MOH buildings and the Army is responsible for military health services.

Capital expenditures in 1980-81 were financed 44 percent by the central Government, 42 percent by foreign assistance, 7 percent by voluntary organizations and 7 percent by insurance plans. They amounted to about 10 percent of total health expenditures. For the health sector as a whole, the central government provided over 57 percent of the total, 65 percent if subsidies are included. The private sector (hospitals, clinics, doctors) accounts for about 30% of all expenditures for medical equipment (see table 3).

Table 2.—Zimbabwe: Imports of medical equipment by country of origin, 1979-80 and projected 1986
(in thousands of U.S. dollars)

	1979	1980	1986
Medical/surgical, electromedical, diagnostic, ophthalmic apparatus and mechanotherapy and respiratory appliances (90.17-90-18)			
United States	405.9	476.8	550
South Africa	590.8	886.8	
United Kingdom	529.6	561.6	
Japan	219.6	219.6	
Germany	350.3	119.5	
All other	251.6	187.7	
Total	2,347.8	2,452.0	3,500
Orthopedic and prosthetic appliances (90.19)			
United States	23.6	—	50
United Kingdom	40.3	50.0	
All other	132.1	122.3	
Total	196.0	172.3	300
X-ray apparatus (90.20)			
United States	319.7	214.1	350
Germany	542.1	189.0	
South Africa	15.3	146.0	
Netherlands	76.5	146.0	
All other	222.4	146.0	
Total	1,176.0	841.1	1,200
Invalid carriages (87.11-12-13)			
United States	34.8	26.4	30
South Africa	79.2	111.2	
United Kingdom	55.6	108.4	
All other	80.6	116.8	
Total	250.2	362.8	400
Combined totals			
United States	784.0	717.2	980
South Africa	685.3	1,166.2	
Germany	943.4	373.9	
United Kingdom	675.5	875.7	
All other	881.6	695.0	
Total	3,969.8	3,828.0	5,350

Source: Central Statistical Office, Customs and Excise, and Interviews.

In the past, less than 10 percent of the health budget had been specifically applied to preventive services, but this amount should rise to over 12 percent with planned greater emphasis on rural health care.

Historically, 85 percent of that budget was devoted to hospitals and clinics, including the showcase Parirenyatwa Hospital (formerly Andrew Fleming) in Harare. However, more and more money today has been going towards rural clinics with almost half of the health capital budget devoted to that purpose in FY 81/82. The present hospital structure under the Ministry of Health is 5 central hospitals (3 in Harare and 2 in Bulawayo); 11 general hospitals in the larger towns; 28 district hospitals; 56 rural hospitals, 9 tuberculosis hospitals and 4 psychiatric hospitals; and about 450 rural clinics (of which about 150 were restored after the war with U.S. AID funds).

Table 3.—Zimbabwe: Estimated expenditures for medical equipment by major user sectors, 1980 and 1986
(in millions of U.S. dollars)

	1980		1986	
	Equipment	Supplies	Equipment	Supplies
Government hospitals and clinics	3.16	13.52	3.5	15.0
Clinical laboratories	.03	.21	—	.3
Private sector (physicians, clinics, industrial hospitals)	1.32	8.81	1.5	10.0
Total	4.51	22.54	5.0	25.3

Note: Equipment includes all capital expenditure items, particularly X-ray apparatus, medical and surgical instruments and appliances, operating theatre furniture, etc.; supplies covers pharmaceuticals, disposables, X-ray film, bandages, gauze, cotton wool, etc.

Source: Central Statistical Office, Ministry of Health, and International Trade Administration, Office of Trade Information Services research report.

Treatment is based on referral up the chain, with facilities ranging from the basic rural clinics to highly sophisticated urban medical centers. At present, medical care is provided free of charge to all who earn less than $208.50/month.

Health care services had been concentrated in the urban centers in which only 20 percent of the population resides. While the average population per bed was about 405 country wide, for the vast majority living beyond these areas, only 7,450 nonmaternity beds were available in 1979-80 (a ratio of 1 bed to 777 persons). Fewer than 100 of the 1,283 doctors registered in 1981 provided services in rural areas. Moreover, nearly four-fifths of the 300 doctors in private practice and 90 percent of the specialists are located in either Harare or Bulawayo.

The Government intends to build 316 new rural clinics to provide out-patient care and limited maternity facilities. The ultimate goal is that no one should have to travel more than 8 kilometers (about 5 miles) to reach a clinic. Financial assistance has been committed for that purpose by the African Development Fund, the European Development Fund and the Government of Sweden. At the same time, plans have been formulated (as shown in table 4) to improve and expand existing rural and district hospitals and to build new district facilities to relieve severe pressure at these levels. The initial part of the program covers six new district hospitals (with an eventual goal of 26, some of which will consist of upgraded rural or mission hospitals) as well as the rural health centers. Each will contain 140 beds and cost $6.95 million. An estimated 25 percent is destined for equipment, all of which must be imported.

Table 4.—Zimbabwe: Capital costs of health care building program
(in millions of U.S. dollars)

	1981/82	1982/83	1983/84	Total
Rural clinics	1.5	4.4	3.4	9.2
Rural and district hospitals	11.4	23.5	33.6	68.5
Urban Hospitals	14.9	8.4	16.8	40.2
Total	27.8	36.3	53.8	117.9

Note: This capital spending plan is being stretched out over an additional fiscal year or more as economic conditions and other problems force delays.

Source: International Trade Administration, Office of Trade Information Services research report.

The need for so much large-scale building and capital improvement was caused by the neglect and destruction of facilities during the struggle for independence. The cost of the war and sanctions imposed on the country also produced a chronic shortage of foreign exchange. The shortage was exacerbated in 1982 and 1983 by low commodity prices for Zimbabwe's exports. The new nation's economic needs were spelled out in the Zimbabwe Conference on Reconstruction and Development (ZIMCORD) held in Harare in March 1981. Health is a key portion of the package with $40.15 million to be spent on mainly rural facilities and with pledges of largely tied aid coming from the United States, Britain, the EEC, and Australia.

There has been an upsurge in private medical care. The prime example is the Umtali Medical Centre, a privately funded hospital of only 17 beds, equipped with its own operating room and maternity unit. The majority of private patients have all medical expenses paid for by one of the various medical aid societies (insurance companies) to which they subscribe for approximately $10/month. The private medical care sector is the center of national debate and its future is uncertain. Still, work has continued on the $12 million Avenue Clinic in Harare, financed by a consortium of large banking, mining, and industrial companies and which will have beds for their employees. This five-story structure will have five operating rooms (including one with clean air), and intensive care, maternity, gynecology, and pediatric facilities upon completion in 1983. If the Government permits, a similar facility will likely rise in Bulawayo and on smaller scales in other urban centers.

Also prominent in Zimbabwe's health care system are some 30 industrial medical services (generally found in mining centers) and voluntary organizations of which mission hospitals and clinics are the most important. There are about 90 mission medical facilities. These largely rural facilities are often the main source of care at present for those in the countryside. The Roman Catholic Church with 33 hospitals and clinics dominates the voluntary organizations. Funding remains primarily in the hands of parent churches; however, 70 percent of all mission hospitals and clinics are assisted by government grants. Also, larger towns have medical departments which provide assistance ranging from spraying to curative services for infectious diseases. Finally, the nation is divided into five administrative provinces in which teams are responsible for health education services as well as notification and eradication of infectious diseases and other health hazards.

Table 5 shows the division of health practitioners in Zimbabwe. The availability of qualified medical staff is a cause of great concern. The Ministry of Health cites a growing need for qualified doctors in many practices; the situation is acute for nurses as well as auxiliary staff for rural work. In addition, no medical college as such exists in Zimbabwe; the faculty is incorporated into the staff of Parirenyatwa Hospital.

The Armed Forces have no hospitals of their own and use government facilities.

Table 5.—Zimbabwe: Number of registered medical, dental, and allied professionals, December 1981

Category	Number on Register
Medical practitioners	1,283
Dental practitioners	178
Pharmaceutical chemists	373
Opticians	37
Dispensing opticians	36
Psychologists	38
Physiotherapists	175
Speech therapists	9
Radiographers	239
Occupational therapists	20
Prosthetists and orthotists	10
Medical laboratory technologists	177
Health inspectors	101
Meat inspectors	45
Dental technicians	33
Dental hygienists	14
Electroencephalographic technicians	10
State registered nurses	5,220
State certified midwives	2,638
Maternity nurses	142
Medical assistants	4,239
Health assistants	417

Source: International Trade Administration, Office of Trade Information Services research report.

Marketing Practices

All purchases of medical equipment and supplies occur in one of two ways: by tender through the Government Medical Stores for the government sector and direct from agents for the private sector. Since approximately 70 percent of all purchases arise from the government sector, the importance of the Government Medical Stores is obvious. It is only the ordering body for the hospitals. There are two government medical stores, one in Harare, the other in Bulawayo. The decisions on equipment needs are taken by the hospital staffs themselves; so, all those interested in the market are well advised to develop good relationships with hospital staffs (especially department heads and surgeons).

The hospitals advise the Government Medical Stores of their requirements. These are advertised in the Friday editions of the national press and via the Government Gazette. Requirements of over $3,475 are subject to decisions taken by the Government Tender Board. Items between $695 and $3,475 are submitted to local agents for private tender. The Stores buy, as well, for government clinics and the missions. The Stores prefer to deal with local agents for their purchases. Hospitals are charged a 10-percent commission for purchases made through agents.

In Zimbabwe, six agents dominate the market for medical equipment. All are especially emphatic on price sensitivity in the marketplace. Delivery is also important, and since overland transport is growing increasingly difficult, many are turning to air freight (providing freight charges do not exceed 25 percent of the item's cost).

In general, the purchasers of medical equipment do not attend trade fairs; an experiment in that direction was unsuccessful. The average mark-up by agents was not divulged, but is thought to be high.

Trade Regulations

The largest barrier to imports is the foreign exchange shortage. Firms are given a foreign exchange allocation every 6 months to cover import requirements. Special needs are covered by ad hoc applications, subject to approval by the Ministry of Commerce. Payment is normally made with the order (upon obtaining the foreign funds).

All items of medical equipment are imported duty free except stainless steel hollowware, which carries a tariff of 32½ + 5 percent. However, an import surcharge of 15 percent is now in effect. No official standards or vetting authority exists; however, the agents themselves usually demand proof from suppliers that items of equipment are in widespread use in the country of origin or other major markets.

Additional Information

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Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in Zimbabwe and trade statistics compiled by the Department of Commerce's Bureau of the Census.

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Saudi Arabia

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Country Market Survey

Food Processing and Packaging Equipment

Saudi Arabia

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AT URBANA-CHAMPAIGN

.S. DEPARTMENT OF COMMERCE
nternational Trade Administration

Exporters of food processing and packaging equipment to Saudi Arabia have reason for optimism. The Saudis spent nearly $80 million[1] for their fast-growing food industry in 1980 and are expected to be buying over $140 million worth by 1987 (see table 1). Saudi Arabia began developing its food industry only in the last decade as part of an aggressive program to develop the Kingdom's economy and build a solid infrastructure. The Saudi Government plays a major role in the country's development and will continue to dedicate much of its oil export revenues to achieving economic goals. The development efforts prescribed in the Kingdom's third 5-year plan (scheduled to end in 1985) place particular emphasis on rural areas, resource development, and processing projects. Under the plan, the dairy, beverage, and fresh produce sectors—markets in which American exporters have performed well—are to receive the lion's share of the Saudi food industry's capital expenditures.

The Saudi **food processing equipment** market was $63 million in 1980 and is expected to increase dramatically to $105 million by 1987 (see table 2). American manufacturers hold second place among food processing equipment suppliers, with sales of nearly $12 million in 1980 and projected sales of about $21 million in 1987. Trade sources foresee fastest growth in purchases (10 percent a year) in the bakery, dairy, and meat sectors. Bakeries are modernizing and automating, sparking demand for new processing equipment. The dairy and meat products sectors are expected to offer similar opportunities for equipment suppliers as local industry strives to replace food imports with domestically produced commodities.

The growth in demand for **food packaging equipment** is somewhat stronger than that for processing equipment. Industry analysts predict sales of packaging machinery to expand some 15 percent a year, up to $38 million in 1987 compared to $14 million in 1980 (see table 3). Wrapping, packing, and handling equipment are said to provide American suppliers with the best sales opportunities. Saudi food packaging techniques lag behind those used for processing, and trade sources say that plant managers will attempt to narrow this technological gap. In addition, both high labor costs and the increasing appearance of supermarkets are expected to enhance demand for automated packaging machinery.

Competitive Environment

Foreign suppliers provide virtually all equipment for the country's food and beverage industry. The lack of economic incentives and skilled labor discourage local manufacture of food processing and packaging equipment. Saudi production is limited to the manufacture of a few conveyor belts, dough mixers, and conventional ovens. Imports are expected to maintain their dominant position in Saudi Arabia well into the future. Trade sources expect the chie sources of supply to remain the United States and Europe.

Food processing equipment.—American companies held 19 percent ($12 million) of the entire food processing equipment market in 1980. They are expected to retain that market share through 1987, with imports increasing almost 9 percen annually over the period. U.S. firms are particularly strong competitors in the beverage, rice processing fruit juice, meat processing, and snack manufacturing sectors of the Saudi food industry. American suppliers have the best opportunities and fewes competitors in these sectors (see Best Sales Opportunities for U.S. Exporters).

American manufacturers supplying the Saudi beverage processing industry include Angelus and Continental. Those supplying local meat processors include Blecher, Butcherboy, and Wolf-King. FMC supplies the fruit juice industry, and Heat and Control, Inc. sells to the Saudi snack industry Carter International and Burgess International are doing well with rice processing machinery.

A broad range of machinery is sold to each o these sectors by U.S. manufacturers. Canning equipment is in demand in the beverage market, but American presence in the bottling segment is limited to one plant. Saudi fruit juice makers buy American

Table 1.—Saudi Arabia: The market[1] for food processing and packaging equipment, 1979, 1980, and projected 1987

(in thousands of U.S. dollars)

	1979	1980	198
Foor processing equipment	34,942	63,230	105,000
Food packaging equipment	12,420	14,122	38,000
Total food processing and packaging equipment	47,362	77,352	143,000

[1] The Saudi Arabian market for food processing and packaging equipment is supplied entirely by imports. Parts are excluded.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Food Processing and Packaging Equipment in Saudi Arabia" (see Additional Information box). Figures in this report are based on data gathered in Saudi Arabia, including available government statistics, industr reports, and trade source estimates and projections.

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[1] All values are shown in U.S. dollars. Local currency data are converted at the following exchange rates: U.S.$1=3.36 riyals (1979), U.S.$1=3.33 riyals (1980), U.S.$1=3.41 (1981), and U.S.$1=3.43 riyals (1982). Values through 1980 are expressed in current rather than constant dollars; values for 1982 and subsequent years are expressed in 1981 constant dollars.

rocessing systems, fruit snippers, and canning quipment. U.S.-built frozen meat flakers, sawing achines, mincers, mixers, tenderizers, power cleavrs, and molding and pressing machines are purhased by the Saudi meat industry. The Saudi snack dustry, still in the developmental stages, presently uys only U.S.-made snack food extruders and otato chip sizer/halver/slicers. American cleaning achines and milling equipment are bought by the ountry's rice millers.

While U.S. companies hold a comfortable position n the food processing equipment market, the Saudis nport most of their processing equipment from urope. Germany is by far the largest foreign suplier, followed by the United States, Italy, Denmark, rance, and the United Kingdom. Foreign suppliers' arket shares tend to vary widely from year-to-year. he reason for such fluctuation is that much of the ountry's food industry develops on the basis of rge turnkey projects, causing unevenness in yearly apital expenditures. Even in the sectors showing teady growth, including the bakery, beverage, and airy product industries, supplier positions vary requently as one firm wins a new contract and nother completes one.

Saudi purchases of processing machinery are ften dependent on the recommendations of project onsultants. Service consultants from Germany, the candinavian countries, the United Kingdom, and France are very active in Saudi Arabia—another advantage for European equipment suppliers.

German concerns supplied 26 percent ($16 million) of food processing equipment imports in 1980 and are expected to widen their position to 30 percent ($32 million) of 1987 imports). They are especially strong in three major sectors: bread-making, beverages, and meat processing. And because all indications are for steadily increasing demand in these sectors, German firms can expect to remain well entrenched in the Saudi processing equipment market. Major German companies serving Saudi Arabia include Noll-Minden, Ottmann and Herbst, Holstein and Kappert, and Enzinger Union, which sell beverage processing equipment. Germany's Kirchfeld sells fat and oil processing equipment, and Laska and Wilhelm Fessman market meat processors. Werner and Pfleiderer is succeeding with machinery for manufacturing bakery products.

Italy is the chief source of relatively inexpensive bakery and confectionery equipment. Italian companies also hold the lead as suppliers of machinery for the pasta, dairy, and fruit and vegetable processing industries. A number of Italian concerns have supplied the Saudi market from plants located in Lebanon. However, recent political and military turmoil there could affect Italian supply patterns. Important Italian suppliers to the Saudi market include Polin, which sells bakery equipment, the

Table 2.—Saudi Arabia: Imports of food processing and packaging equipment by country of origin, 1979, 1980 and projected 1987

	1979		1980		1987	
	Value ($ thousands)	Share (%)	Value ($ thousands)	Share (%)	Value ($ thousands)	Share (%)
ood processing equipment						
United States	3,405	9.7	11,751	18.6	21,000	20.0
Germany	16,296	46.6	16,389	25.9	31,500	30.0
Italy	3,622	10.4	5,581	8.8	8,400	8.0
Denmark	3,470	10.0	3,902	6.2	7,300	7.0
France	2,452	7.0	3,771	6.0	8,400	8.0
United Kingdom	292	.8	3,347	5.3	6,300	6.0
Other countries	5,405	15.5	18,489	29.2	22,100	21.0
Total	34,942	100.0	63,230	100.0	105,000	100.0
ood packaging equipment						
United States	1,590	12.8	1,181	8.4	4,500	11.8
Germany	4,915	39.6	6,342	44.9	15,200	40.0
Sweden	1,335	10.8	1,702	12.1	5,800	15.3
France	567	4.6	1,366	9.7	3,800	10.0
Italy	3,053	24.6	1,242	8.8	3,000	7.9
Other countries	960	7.6	2,289	16.1	5,700	15.0
Total	12,420	100.0	14,122	100.0	38,000	100.0
otal imports	47,362	—	77,352	—	143,000	—
otal imports from U.S.	4,995	10.6	12,932	16.7	25,500	17.8

Source: See source notation of table 1.

pasta maker IBP, and Mark, which markets ice cream making equipment. Other successful Italian companies include Ocrim (grain milling equipment), Samifi (refrigeration machinery), Dominici (confectionery-making machines), Manzini (tomato concentrate makers), and Bangolini (filling machines).

Suppliers from Denmark and Sweden are very strong competitors in the dairy industry. The Swedish firm, Alfa-Laval, is a leading dairy equipment supplier, and Pasch Silkeborg is a top Danish supplier. Baker Perkins of Great Britain is another European supplier active in the Saudi market, selling biscuit-making machinery. The Swiss firm, Buhler, is one of the leading suppliers of gain milling machinery to Saudi Arabia. This company markets its equipment through manufacturing units located throughout Europe.

Food packaging equipment.—The United States is the third largest exporter of food packaging equipment to the Kingdom, commanding 8 percent ($1 million) of the Saudi market. The U.S. position in the market is expected to grow some 12 percent annually, to $5 million in 1987. Frank-O-Matic, selling packaging lines, is by far the strongest American supplier in the market.

German firms are again the largest suppliers, controlling 45 percent ($6 million) of the market in 1980. The German position is expected to slip to 40 percent ($15 million) by 1987, while some of its competitors (from the United States, Sweden, and Belgium, among others) expand their shares. Top German firms include Multivac, which sells multi-packers, and Kappfass, which markets shrink wrappers. French and Italian companies are also major suppliers, with market shares of 10 percent and 9 percent, respectively. Italy's Catabrigga, for example does well with its direct wrappers.

Table 3.—Saudi Arabia: Sales [1] of food processing and packaging equipment, by end-user sector, 1980 and projected 1987

(in thousands of U.S. dollars)

	1980	1987
Food processing equipment	14,122	38,000
Meat and fish	4,734	9,400
Dairy products	3,196	6,300
Preserved fruits, vegetables, and specialty products	4,621	7,500
Grain mill products	1,826	2,400
Bakery products	28,199	55,200
Sugar and confectionery products	1,598	2,300
Fats and oils	3,764	2,300
Miscellaneous food products	4,068	5,900
General purpose equipment	11,224	16,000
Subtotal	63,230	105,000
Food packaging equipment [2]	14,122	38,000
Total	77,352	143,000

[1] Values exclude duties, taxes, and distribution costs.

[2] No sector breakdown is available for sales of food packaging equipment in Saudi Arabia.

Source: See source notation of table 1.

The Food Processing Industry

By the end of 1981, about 150 establishments produced processed foods in Saudi Arabia, with many more expected to be operational in the near future (see table 4). Bakery, dairy, fruit, and beverage manufacturing units accounted for nearly 70 percent of the plants. Other significant sectors are meat processing and miscellaneous food products makers. Overall, the industry employed almost 9,000 people in 1981, of which 1,700 were in the dairy sector, nearly 2,300 in the beverage sector and 1,100 in the bakery sector. With the constantly expanding development of these sectors, a commensurate increase in total employment is expected The other major employers are fruit and vegetable processing, meat processing, and sugar and confectionery manufacturing. The average number of employees per industry unit in 1981 was 60, with a high sectoral average of 133 in beverages and a low of 27 in bakeries.

Total invested capital in the food processing industry was nearly $1.3 billion at the end of 1981 (see table 5). The dairy products sector accounted for 23 percent of the total, and the bakery sector claimed 16 percent. Industry analysts predict that food processors will increase invested capital same 15 percent a year, to well over $2 billion by 1985. While the dairy sector is expected to increase its share to 26 percent ($551 million), the bakery sector could see a decline in its share, down to only 12 percent ($260 million) in 1985. In the grain milling sector, rice millers' invested capital is expected to grow the fastest, a whopping 115 percent a year through 1985. Rice processors' investment should swell from only $1 million in 1981 to over $30 million by 1985.

The dietary and shopping habits of Saudi Arabians and immigrant Arabs differ greatly from those of Westerners. The daily diet of the typical Saudi consists of freshly killed meat, fresh vegetables, and rice and potatoes for carbohydrates. Most of these items are still generally bought from local street vendors and grocers, but some Saudis are now turning to the large supermarkets for food items. The inceasing popularity of the big stores can be expected to influence traditional retail supply patterns in the Kingdom, especially in major metropolitan areas. Consumption of canned food is minimal and limited to an occasional tin of fish or meat, usually opened for unexpected visitors or outings. Prepared

Saudi Arabia: Best Sales Opportunities for U.S. Exporters of Food Processing and Packaging Equipment

- Meat, Poultry, and Egg Processing Equipment
  - Tenderizers
  - Sawing machines
  - Lard plasticizers
  - Compactors
  - Disintegrators
  - Molding machines/presses

- Poultry defeathering and eviscerating equipment
  - Rendering equipment
  - Frozen meat flakers/slicers/cubers
  - Bone choppers
  - Boning machines
  - Power cleavers
  - Sausage stuffing machines
  - Slaughtering equipment

- Dairy Products Manufacturing Equipment
  - Centrifugal cream extractors
  - Homogenizers
  - Pasteurizers
  - Sterilizers
  - Ice cream preparation/freezing/cutting/coating equipment

- Grain Mill Products Manufacturing Equipment
  - Flour bleaching machines
  - Brushing machines
  - Graders
  - Hoppers
  - Sifting machines
  - Cleaning machines
  - Rice polishing machines
  - Magnetic separators

- Bakery Products Manufacturing Equipment
  - Bread-making machines
  - Dough mixing/kneading/dividing/rounding/proofing machines
  - Pastry rolling calenders
  - Enrobing machines
  - Pie machines
  - Shaping machines
  - Biscuit/wafer/cracker machines
  - Cake depositing/icing machines
  - Continuous process ovens

- Sugar and Confectionery Products Manufacturing Equipment
  - Shaping machines
  - Form presses
  - Tableting machines

- Fats and Oils Processing Equipment
  - Margarine-making churns, etc.
  - Oil seed crushers/grinders

- Beverage-Making Equipment
  - Soft drinks, flavoring extracts, and syrups equipment
    - Filtering machinery
    - Carbonating equipment
    - Concentration control equipment

- Fish and Seafood Processing Equipment
  - Filleting machines
  - Scaling machines
  - Shelling machines
  - Grinding machines
  - Opening machines

- Miscellaneous Food Products Manufacturing Equipment
  - Coffee mills/grinders/blenders/roasters
  - Potato chip sizer-halvers/slicers/fryers
  - Corn popping machines
  - Snack food extruders

- Multi-Product and General Purpose Food Processing Equipment
  - Quick freezing and refrigeration equipment (most salable in meat/poultry/eggs, dairy products, fish/seafood sectors)
  - Food preparation, processing, and control equipment (dairy products and beverages sectors)

- Forming, Filling, and Sealing Equipment
  - (dairy products and beverages sectors)

- Wrapping, Packing Equipment
  - Wrappers
    - (meat/poultry/eggs, bakery products, sugar/confectionery products, fish/seafood sectors)

- Marking, Inspecting Equipment
  - (meat/poultry/eggs and beverages sectors)

- Container/Product/Package Preparation and Handling Equipment
  - (dairy products, grain milling, beverages sectors)

onvenience meals are virtually unknown in Saudi rabia. The same can be said of desserts, with one mportant exception: creme caramel made from a owdered mix is one of the most popular desserts in audi Arabia.

Saudis rarely go out for dinner. Instead, the usual ractice is to have dinner parties in the home, supplementing homemade items with catered dishes. In addition, the standard Saudi workday hinders the development of restaurants and caterers. Government offices have a continuous working day, ending at 2:30 p.m. when most people go home for the main meal of the day. Private businesses are open from 9 a.m. and 1 p.m., close between 1 p.m. and 5 p.m.

for food and siesta, and then reopen for business until 8 p.m. Nevertheless, the last few years have seen growth in the number and variety of restaurants. Many of the new eateries offer fast-food menus, chiefly hamburgers and sandwiches, and attract youngsters, foreigners, and young working people who prefer to eat out at midday.

The growth in fast-food establishments has given meat processors and meat processing equipment suppliers new opportunities. And, the increasing acceptance of supermarkets and prepacked foods by the local population has augmented demand for automated packaging equipment. However, the majority of the prepacked food items are still supplied by imports.

Meat, poultry, and egg processing.—The Saudi meat processing industry has developed chiefly to supply the demands of the country's substantial population of non-Arab expatriates. Local consumers generally limit their meat purchases to live lambs and chickens for slaughter at home or by a neighborhood butcher. The sector's six processors employed 400 workers in 1980 and had a combined licensed capacity of 31,000 metric tons (mt) per year (see table 6). Their products are mostly simple meat cuts packaged and frozen for supermarkets and some ground meat, hamburger patties, and prepared items such as salamis and mortadellas. In addition to supplying supermarkets, processors sell to the growing population of fast-food and sandwich shops. Demand also comes from the catering industry, which serves immigrant worker camps at construction and other project sites. A few larg scale slaughterhouses produce fresh meat, but the remain rare.

Poultry production has jumped dramatically i recent years. New commercial ventures have raise output from 14 million fowl in 1975 to an expecte 30 million in 1980. Annual egg production triple from 200 million to 600 million, between 1975 an 1980. Despite this promising growth, local poultr production supply only 20 percent of the marke domestic egg output meets 70 percent of consume needs. Furthermore, there is no domestic poultr processing industry. All local chickens are sold liv while the dressed and frozen birds on the market a exclusively imports.

Saudi Arabia's harsh environment provides littl pasture land for larger animals. Despite governme subsidies and incentives, livestock production co tinues to fall far short of demand from both co sumers and processors. In 1980, some 4 million liv sheep, goats, cattle, and camels were imported t supplement the 7.4 million head of domestic liv stock just to satisfy the fresh meat market. Some the imported animals are brought to market an slaughtered on arrival; others are fattened first.

Processors use only imported frozen carcasse primarily from Australia, India, and New Zealan Frozen meat imports stood at nearly 66,000 mt i 1980 and are rising annually. In contrast, impor of prepared meat products are expected to decli as the domestic industry increases its output. I 1980, imports of ground, canned, salted, smoke and prepared products totaled some 7,000 mt. B 1987, foreign purchases should drop to less tha 5,000 mt.

The Saudi Factory for Meat is the largest dome tic plant, with licensed annual production capacity 12,000 mt of frozen meat and 2,000 mt of prepare meat products. The Saudi Meat and Food Plant capable of packing and preparing 7,500 mt frozen and prepared meat per year, and Vita Com pany for Food Products has an annual license capacity of 3,700 mt. The remaining three factorie can produce between 1,500 mt and 3,000 mt in year.

According to industry observers, many mea plants are operating well under capacity. Thus, th potential already exists for substantial increases i the production of prepared meats. Saudi planne are encouraged by the public's slowly growin interest in supermarkets. Twelve additional mea processing and packing plants were either license or under construction at the end of 1981. Th largest of these, the Al-Najdi Meat Plant, will pre pare 43,000 mt of meat products annually, and wi be equipped with slaughterhouse facilities capabl of handling nearly 200,000 head a year. Existin plants have expansion plans, too. National Mea

Table 4.—Saudi Arabia: Total employment and number of establishments by size,[1] in food processing industry sectors, 1980

Sector	Total employment	Number of establishments Total	Large	Medium	Small
Meat, poultry, and eggs	400	6	3	3	—
Dairy products	1,690	29	10	9	10
Preserved fruits, vegetables, and specialty products	958	14	6	4	4
Grain mill products	688	14	5	2	7
Bakery products					
Sugar and confectionery	1,119	41	3	23	15
products	843	8	1	2	5
Fats and oils	300	1	1	—	—
Beverages	2,267	17	14	3	—
Fish and seafood	100	1	1	—	—
Miscellaneous food products	466	15	3	6	6

[1] Size of establishments is based on number of employees, as follows: large, 50 or more; medium, 20 to 49; and small, fewer than 20.

Source: See source notation of table 1.

lants in Riyadh is increasing capacity from 150 it to 220 mt a day, adding corned beef, smoked risket, and salami to its product line. Vita is also lanning to produce salami. All told, these plants ill add over 120,000 mt to the country's annual ozen and prepared meat capacity. Such expansion iould help boost the sector's spending on food rocessing equipment from $5 million in 1980 to a rojected $9 million in 1987. For the longer term, ade sources predict growing demand for slaughterouse equipment as the larger plants arrange coperative agreements or partnerships with local vestock breeders.

Because meat processing is a relatively new inustry in Saudi Arabia, there are no programs to search and develop new products. However, the rge plants have fully equipped quality control boratories. Saudi plants use semiautomatic processg lines employing established American and Euroean techniques and equipment of medium-level chnology. Most plant managers hope to move to lly automated systems in the future to help reduce e high labor costs in this extremely competitive arket. Polyethylene filb packaging techniques are e norm, using the latest automated equipment vailable, primarily Multivac systems made by Koch U.S.). Some 200,000 running meters of the film self are purchased by Saudi plants each year.

Dairy products.—Milk and dairy products have ng been a staple in the Saudi diet. Dairy processors e increasing production of packaged milk and airy products to help satisfy steady demand owth. However, both consumers and the sector's 9 processors still must rely heavily on imports. A tal of 300,000 mt of milk and dairy products were nsumed in 1980, and that is expected to swell to 00,000 mt by 1985. Cheese output is also rising, ut the Government discourages butter production ecause, given the Kingdom's low per-capita conumption, it is not presently considered a feasible nture.

Milk production is also clearly on the rise. By 985, trade sources estimate that the number of Saudi airy farms will leap to 52 from the 1978 count of nly 15. Annual domestic milk production is projcted to increase to 172,000 mt. Despite substantial owth in both milk and dairy products output, emand still exceeds domestic production. While esh milk imports are steadily declining, substantial uantities of powdered milk are still imported—5,000 mt in 1980—for use in many traditional milkased products. Cheese imports continue to increase, pping 39,000 mt in 1980.

The top dairy processor, the Danish Saudi Dairy ompany, has one plant with a daily milk processing pacity of around 70,000 liters, and an annual pacity of 26,000 mt for dairy products. Typical of a number of the larger Saudi processors in the sector, Danish Saudi is a joint-venture of Danish Turnkey Dairies, Gulf Fisheries of Kuwait, and various Saudi and Kuwaiti businessmen. Jamjoom Foremost Dairy Company can produce 30,000 liters of milk a day. Other processors include Danya Milk Products, the Green Valley Factory, and the National Factory for Dairy Products. The biggest cheese factory, run by the Saudi Establishment for Cheese Products, manufactures 8,000 mt of white and processed cheese each year.

Table 5.—Saudi Arabia: Total invested capital by food processing industry sectors, 1981 and projected 1985

(in millions of U.S. dollars)

Sector	1981	1985
Meat, poultry, and eggs	170.4	204.2
Dairy products	293.7	550.9
Preserved fruits, vegetables, and specialty products	138.4	254.6
Grain mill products	200.9	346.2
Bakery products	206.6	260.3
Sugar and confectionery products	19.4	143.3
Fats and oils	36.3	43.6
Beverages	174.2	331.1
Fish and seafood	2.2	5.2
Miscellaneous food products	27.2	94.3
Total	1,269.3	2,233.7

Source: See source notation of table 1.

Saudi dairy processors are optimistic that demand growth will persist. The sector's new plants are expected to boost output enormously. By 1985, some 88 plants will have a licensed capacity of 575,000 mt and employ nearly 5,000 workers. Saudi dairy product factories are usually built on a turnkey basis. Most new plants, either planned or under construction, tend to be medium-sized facilities. Some will be large operations. At the end of 1980, there were 10 large, 9 medium, and 10 small dairy plants. Of the 59 processors to be added to the sector, only 8 will be small units and 26 will be medium-sized operations.

Most of the planned facilities will be constructed outside major cities, and many will be located in the eastern part of the Kingdom where development of dairy farms is being emphasized. Danish Saudi is building two of the largest new milk plants: a 50,000-liter unit in Riyadh and a 35,000-liter facility in Dammam. Danish Saudi is also doubling capacity at its Jidda plant. Licensed cheese production capacity should expand to about 16,000 mt by the end of 1982, up from about 12,000 mt in 1980. Spending on processing equipment in the dairy products industry is expected to double, from $3 million in 1980 to over $6 million by 1987, as a result of the sector's planned expansion.

Although most dairy processors use modern equipment, a number of them continue to operate with obsolete, aging machinery and somewhat casual production methods. For example, the Saudi Government closed a number of unlicensed yogurt plants in Mecca in 1980 because of poor safety conditions. The majority of large plants are automated, but medium-sized facilities tend to be only semiautomated because of smaller output volumes. For the most part, plants now under construction will be fully automated, which is expected to minimize labor requirements and reduce safety and health hazards. All recombination plants in Saudi Arabia use the ultra-high temperature treatment for making milk and employ Tetrapak or Pure-Pack systems for packaging their products.

Preserved fruits, vegetables, and specialty products.—The fruit and vegetable processing industry is a medium-sized sector with good growth potential predicted. Saudi consumers are eating more fruits and vegetables; the Government estimates consumption will rise to 950,000 mt by 1985, compared to 631,000 mt 5 years earlier. Imports are rising rapidly, but Saudi officials are determined to expand both domestic processing capacity and crop yields. To that end, trade sources expect the Government to impose a 20 percent duty on some imports in the near future as a step toward encouraging development of the local industry. The sector's 14 licensed plants had a combined annual capacity of 82,000 mt in 1980. By the end of 1982, six more units should be operational. The sector currently employs about 1,000 workers.

Except for date packers, most plants now in operation process imported ingredients and are located near major cities where they can serve the majority of their customers. All juice and vegetable processing units are in either Riyadh, Jidda, or Dam mam/Al Khobar. The Kingdom's three license date processors are located in Medina. They have combined capacity of only 600 mt. Annual dat production is over 450,000 mt. The bulk of the cro is processed and packaged by a large number unlicensed firms. Only three plants pack processe tea. One processor makes tomato paste, but only i winter when fresh tomatoes are available at reaso able prices. Licensed jam producers generate le than 1,000 mt a year. The rest of the licensed fru and vegetable processors do most of their busine with the Education Ministry, packing and wrappin school meals.

Table 6.—Saudi Arabia: Licensed production capacity by industry sector, 1980, 1981, and projected 1985

(in thousands of metric tons)

Sector	1980	1981	1985
Dairy products	31.2	85.1	158.9
Preserved fruits, vegetables, and specialty products	215.3	307.1	625.6
Grain mill products	82.1	129.9	296.5
Bakery products	1,041.6	1,041.6	1,725.4
Sugar and confectionery	202.8	274.3	416.5
products	20.4	23.7	161.6
Fats and oils	60.0	60.0	71.6
Beverages	592.4	632.4	1,044.5
Fish and seafoods	1.0	1.0	2.5
Miscellaneous food products	38.1	39.6	105.8
Total	2,284.9	2,594.7	4,608.9

Source: See source notation of table 1.

Although Saudi farmers have increased net yiel of such crops as tomatoes, dry onions, okra, marro squash, carrots, and cucumbers, imported fresh an processed vegetables continue to supply the bul of demand. Imports topped 375,000 mt in 1980, sharp rise from 165,000 mt 3 years earlier. Preserve vegetables, mostly canned, accounted for 40 percen of total 180 imports, while fresh and dried vege tables made up the most of the rest. Turkey an Lebanon are major sources of the Saudi Arabia vegetable imports.

Just over 762,000 mt of dates, melons, grapes, an assorted citrus fruits were grown in the Kingdom i 1979. But like vegetables, imported fresh an processed fruits are the most important source supply. Fresh imports, mostly citrus fruits, banana apples, and grapes, expanded dramatically in just years, to almost 500,000 mt by 1980. Saudi proce sors, however, use only the locally-grown produce.

Imports of packaged fruit juice expanded fro $94 million to $168 million between 1977 an 1980. In volume terms, there was an increase two-thirds, with 138 mt of packaged fruit juice im ported in 1977 compared to some 230,000 mt i 1980. However, as local production has risen, impo growth has slowed. Only 75 mt more packaged fru juice was imported in 1980 than in 1979. Neverth less, imports of predominantly American, Japanes and Danish concentrate and powdered juice, use mostly by processors, more than doubled, from 5,57 mt to 11,000 mt between 1977 and 1979.

The sector's processors have achieved a hig level of technological development. The majority licensed fruit and vegetable processing firms bega operations in the late 170's, and their manageme teams were actively involved in equipment selectio Turnkey projects are rare in this sector. Mo plants are medium-sized and fully automated. A cording to trade sources, however, plant manage complain about problems in servicing their ne equipment. In spite of limited market exposur American equipment is well regarded and considere both price competitive and efficient.

Most Saudi fruit juices and nectars are canne about 15 percent is packed in Tetrapaks. Total packaged juice output is about 300 million units a year. Experts say positive cost and marketing factors ensure an increasing market share for Tetrapaks. While canned juice products should continue to dominate the market for the next few years, processors are not expected to expand fruit and vegetable canning operations significantly in the near future.

Of 20 new licenses recently issued to fruit and vegetable processors, 8 went to juice makers. Total new licensed capacity is estimated at 60,000 mt, which involves an additional capital investment in excess of $53 million. This expansion plus expected future projects should boost processing equipment sales to $8 million by 1987, up from $5 million in 1980.

The major plants that have been issued new licenses are: The Saudi Cider Factory, the Saudi Fresh Juice Company, Tip Top for Juices and Carbonated Fruit Juices, and the Al-Qasim Plant for Date Packing, all located in Riyadh. Another recently licensed plant is the Middle East Juices Factory in Jidda.

Grain mill products.—The grain milling industry is comprised of three subsectors: flour milling, animal fodder, and rice processing. The flour sector has the largest production capacity, followed by animal feed and rice. Since the sector recently went through an expansion period, only a limited amount of additional growth is expected. Sales of processing equipment were relatively high in 1978, totaling nearly $3 million as the Saudis made a number of large purchases for new plants. In 1980, sales dropped to just under $2 million. Projected annual growth of about 4 percent a year is expected to increase equipment spending to $2.5 million in 1987.

In Saudi flour milling, three modern facilities operated by the state-owned Grain Silos and Flour Mills Organization (GSFMO) are the dominant operations. Rural area needs are met by several small units. The GSFMO plays a key role in the grain milling industry. It runs the wheat price support program, manages sales of flour to bakeries and feed to farmers at subsidized prices, and stockpiles grains for the Kingdom. In addition to the flour mills, GSFMO operates four grain silo complexes.

GSFMO's Grain Industrial Complex in Riyadh, which commenced operations in 1977, has an annual flour milling capacity of 210,000 mt and an animal feeds milling capacity of 50,000 mt. Silo storage capacity is 80,000 mt. Grain facilities at Dammam and Jidda both started up in the late 1970's. The capacities of the Dammam operation mirror the complex in Riyadh. The Jidda facility is the largest of the three, with an annual grain processing capacity of 325,000 mt of flour and 50,000 mt of fodder, and a silo storage capacity of 125,000 mt. At the end of 1980, the Government's flour milling capacity was 745,000 mt, and its combined animal feed capacity was 150,000 mt.

Wheat production is the success story of Saudi agricultural policy. The Agriculture Ministry estimates that improved seed programs and Government subsidies led to a doubling of wheat production, from 72,000 mt to 150,000 mt a year between 1970 and 1980. However, there is some conflict over the accuracy of those estimates, with GSFMO reporting much lower figures for domestic production. GSFMO buys wheat from Saudi farmers at prices 4 times higher than the price of imports, yet it purchased only 6,000 mt in 1979.

Even though wheat imports tend to be erratic, the general trend is upward. An abnormally large quantity of wheat—290,000 mt—was imported in 1979 to create a buffer stock before import prices rose in the second half of the year. Wheat imports were only 29,000 mt in 1978 but climber to 172,000 mt in 1980.

Wheat flour imports have risen steadily over the last few years. Imports were 380,000 mt in 1978, 431,000 mt in 1979, and 434,000 mt in 1980. However, due to GSFMO support policies, the rate of increase appears to be leveling off. In addition, the Government estimates that general demand for all flour products will actually decrease by 1985—to 649,000 mt, down from 694,000 mt in 1980—as consumer purchasing power rises and cereals are replaced with higher-priced foodstuffs.

Existing mill and silo facilities are among the most sophisticated in the world. All were constructed by the Swiss firm, Buhler, which beat out American competitors by offering comprehensive contracts for each of the Saudi Government's mills. Still, U.S. manufacturers provided the grain cleaning machines and most of the packing and general purpose equipment. At the Riyadh complex, for example, Carter Day supplied the grain separators, Bemis provided the packing equipment, and Krais and Technovator sold the general purpose machinery. The silos were built by the German firm, Dyckerhoff and Widmann. Fauma, also of Germany, provided a retail packing machine in 1981.

The Saudi Government has decided to expand existing facilities rather than build additional units. The rationale behind this decision is to ensure continuity and to manage grain stockpiling. GSFMO has set a 6-month supply goal for stockpiling, a level it believes is more attainable with concentrated control of facilities. Centralized management also makes it easier to buy grains from local producers.

Buhler is expected to win the contracts for most of the new projects. However, the extensive use of American equipment consultants by GSFMO is expected to prove beneficial to U.S. suppliers. Industry analysts agree that, to increase sales in the

Kingdom, U.S. firms must be prepared to send technical teams and specialists to work in Saudi Arabia at competitive salaries. In addition, they advocate more aggressive marketing strategies and utilization of the local American embassy.

The private sector operates nine animal and poultry feed processing plants, which had a licensed capacity of 280,000 mt at the end of 1981. Two more projects have been licensed, but it is uncertain whether they will be built. Several commercial farms have their own limited-capacity feed mills. Jidda, with an installed capacity of 142,000 mt a year—over half of the private sector's licensed capacity. Other major private plants include the Saudi Arabian Fodder Company in Dammam, with about 20 percent of private licensed capacity, and the Al Malouhi Feed Factory in Riyadh, with 8 percent.

The market for animal feed is relatively small because the Saudi livestock industry is still in the developmental stages. Imports were a significant 115,000 mt in 1979 but fell to 91,000 mt in 1980 as local production began to rise. Poultry feed accounts for the greatest portion of fed imports. Other imported feeds include small amounts of hay and prepared animal forage.

Most Saudi animal feed factories are built on a turnkey basis. Several are joint ventures with European concerns. The Dutch firm, Provimi, for example, has a 20 percent share in the Saudi Arabian Fodder Co., while the Italians are involved in the Fakieh Poultry Feed Factory. Private factories use medium-level, fully automated technology, and employ only about 170 workers. Fakieh Poultry, currently the only plant with plans to expand, has already begun construction of a new facility. Three licenses were recently issued for new feed plants to Ghars Limited in Riyadh, Al-Nasser Feed Factory in Tabuk, and Saudi Soya Products in Jidda. Poultry and livestock feed producers are expected to increase combined capital investment to $66 million by 1985, up from $20 million in 1981.

At present, Saudi Arabia has only one rice mill. Located in Jidda, it has a licensed capacity of 90,000 mt and began operations in 1977. The plant is equipped entirely with U.S.-made machinery supplied by Broadway Sheet Metal, Carter Day International, Burgess Independent, Marathon Metallic Building, Howe Richardson Scale, and Green's Hardware. The Saudi International Rice Company, which owns the rice plant, plans to construct a similar facility in Dammam, with a total capital investment of nearly $30 million. American suppliers are expected to be called upon for this new plant as well. No rice is grown in Saudi Arabia, but trade sources predict steady demand growth resulting in continued import expansion.

Bakery products.—The Saudi bakery products industry is highly decentralized, with bakeries scattered across the country. Even small towns have at least one bakery. Unlike the operations of other food processing sectors, which tend to be concentrated near major markets and sources of supply, licensed bakeries are generally located outside the major metropolitan areas.

Ample supplies of flour at subsidized prices, a large foreign community, and soft Government loans provide the incentives to invest in modern baking equipment. Producing both European bread and the traditional Arabic bread (shami), the industry bought $28 million worth of new processing equipment in 1980. Bakers are expected to spend 10 percent more on equipment each year through 1987, when sales are expected to top $55 million.

Most large commercial bakeries use modern equipment. At the end of 1980, there were 41 operating, licensed bakeries. According to industry analysts, the sector had a total workforce of 1,119 in the same year. By the end of 1982, the number of licensed bakery establishments had increased to 67, and 650 more people were employed in bakeries. Medium-sized firms are the trend. Only four big plants are licensed, and the share of the market occupied by small commercial bakers slipped to 28 percent in 1982, compared to 37 percent in 1980.

One of the largest bread-making firms in the country is owned by the Badr family, which operates five automated bakeries in Jidda and Mecca. These bakeries together produce upwards of 22,000 mt annually. Other major firms include the Al-Arfaj Automatic Bakeries in Riyadh, with a 13,500-mt capacity; the Al Ehsaa Automatic Bakeries in Hofouf, with an 11,000-mt capacity; and the Taba bakery in Medina, with a 26,000-mt capacity.

Because of Government grain subsidies, bread is one of the cheapest foodstuffs in the Kingdom. The Saudi table would be incomplete without the circular, flat shami. Samouli is another popular kind of bread used for sandwiches. Sliced loaf bread, unknown to Arab households, is consumed mostly by Western expatriates. Trade sources say that total bread consumption is extremely difficult to estimate. However, licensed capacity was well over 347,000 mt by the end of 1982, up from 202,826 mt in 1980. And about 60 percent of that capacity is attributable to operations located outside the major markets of Jidda, Riyadh, and Dammam. Based on flour consumption statistics total national bread purchases are estimated at about 1 million mt per year.

At present, there is only one biscuit manufacturer in Saudi Arabia, the Badrah Factory in Jidda, which has an installed capacity of 20,000 mt a year. Biscuit imports have dropped significantly since 1979 when the Government imposed a 20 percent import duty and domestic production began to accelerate. Imports fell about 26 percent in 1980, to 37,370 mt, down significantly from 50,920 mt the year before. Trade sources expect biscuit consumption in Saudi Arabia to expand by as much as 50,000 mt by 1987, with local production retaining its 35 percent market share. Three new licenses have been issued for biscuit plants. In addition, industry analysts say that major confectionery manufacturers will be considering biscuit-making, offering excellent opportunities for U.S. vendors of the appropriate equipment.

Italian and German baking equipment is the most widely used. Some of the small neighborhood bakeries use Italian equipment, most of which comes from Lebanon. Others purchase second-hand equipment from larger bakeries. The typical neighborhood bakery has a couple of dough mixers, a shaping machine, and two conventional ovens. Daily production ranges from 1-5 mt, and most of the loaves are sold unpackaged in front showrooms. These little establishments may also sell small quantities of confectionery items. Quality is generally high and consumers tend to prefer the better tasting local breads over mass-produced loaves sold by the larger, automated bakeries.

Automated bakeries first came to Saudi Arabia in 1978. They supply grocery stores, hospitals, government institutions, and supermarkets, although several larger supermarkets have set up their own bakeries. Most of the large bakeries also sell through their own retail outlets.

Badr's newly installed production lines illustrate the extent to which Saudi bakers are modernizing. Badr had completely renovated its plants by 1978. Using German-made equipment supplied by Werner and Pfleiderer, Badr's production lines are now fully automated. Nevertheless, most of the firm's 100 employees still package individual loaves by hand.

The Saudi bakery products industry offers growing opportunities for process equipment suppliers. Licensed capacity is expected to grow steadily as the Government continues to subsidize this sector. Three kinds of equipment will be in great demand: packaging equipment; complete new installations for automated, medium-sized bakeries; and replacement equipment for smaller units looking for low-priced or second-hand machinery.

German equipment is the most highly regarded, but trade experts say American machinery would be well received if given adequate exposure. At the modern bakeries using U.S.-built equipment, plant managers are satisfied with the performance and reliability of American brands. But few U.S. firms have actively promoted their bakery equipment in Saudi Arabia. Saudi bread manufacturers are open to any offer that is price competitive and includes after-sales technical service.

Sugar and confectionery products.—Saudi Arabia has no sugar-refining sector, although two projects are currently under consideration. Most of this sector's purchases of processing and packaging equipment are made by confectionery manufacturers. Equipment sales to confectioners were $1.6 million in 1980 and are expected to grow about 5 percent a year to $2.3 million in 1987.

The Government has been investigating ways to create a sugar-refining sector since 1970, but has determined it is not yet commercially viable. Two licensed ventures are still active, though no construction has actually started. One of the licensed projects, a joint venture with Tate & Lyle of the United Kingdom, calls for construction of a sugar mill in Jidda capable of producing some 100,000 mt each year. The other licensed project is for a sugar packaging plant, also in Jidda, which is to handle up to 4,500 mt annually.

Another potential project, a joint venture of Saudi interests and the Taiwan Sugar Corporation, involves construction of a Dammam sugar processing plant, also with a capacity of 100,000 mt per year. However, since the Government has found that the Kingdom's climate and terrain are ill-suited for the cultivation of sugar-producing crops, such as sugar beets, the plant would probably process imported brown or raw sugar. Sugar imports have risen steadily over the last few years, amounting to 256,000 mt in 1980. The chief suppliers are Czechoslovakia, Taiwan, France, and the United Kingdom.

Three other companies hold sugar-processing licenses, although no plans have been announced. They include the Saudi Sugar Company and the Arabian Sugar Factory in Jidda, and the Bafrat Industry Factory in Riyadh.

The confectionery sector had a total licensed capacity of 17,000 mt in 1980. By the end of 1982, capacity climbed to 23,000 mt. With the recent completion of two medium-sized plants, Saudi Arabia now has 10 licensed plants in operation and 9 others licensed but not built or operational. Most are situated in Jidda and Riyadh, and one factory in Dammam is near completion. In addition to these major units, hundreds of small confectioners make various kinds of locally popular sweets and sell them through their own outlets. Annual consumption of confectionery products is estimated in excess of 50,000 mt a year, of which 30,000 mt are imported.

The biggest confectionery manufacturer is Badrah Saudi Factories in Jidda, with an annual licensed capacity of 7,565 mt. Badrah employs nearly 90 percent of the industry's 912 workers but operates at only 60 percent of its licensed capacity.

The confectionery sector is the least automated sector of the Saudi food processing industry. German and British equipment is the most widely used, but it tends to be severely antiquated and requires high labor input.

According to industry experts, the Saudi confectionery sector must modernize if it is to compete successfully with higher quality imports. In addition, installation of modern, up-to-date facilities could mean expanded exports of confectionery products to neighboring countries. Packaging techniques above all else must improve. Polyethylene or cellophane packets, manually applied to the goods, are the most common forms of packaging.

The sector's expansion plans include seven recently issued licenses for confectioners. The majority of the new plants are to be medium-sized facilities. This expansion represents a total capital investment of about $47 million. The Arabian Factory for Sweets and Chewing Gum and the Hala Confection-Factory, both in Riyadh, are the largest potential projects.

Saudi confectioners are now looking for reliable, efficient processing equipment and automatic packaging machinery. Although European firms are the more prevalent suppliers of new equipment, some American-built equipment is in demand. However, Saudi equipment buyers voice two major concerns regarding U.S. equipment. First, there is very little information available to purchasers about U.S. machinery. Second, unlike their European counterparts, few American sales representatives actually visit local manufacturers. These two factors have hindered sales efforts by U.S. companies.

Fats and oils.—Saudi Arabia has only one factory producing fats and oils: the Saudi Vegetable Oil and Ghee Company. This plant, located in the Jidda Industrial Area, has a licensed annual capacity of 60,000 mt and began operations in 1981. No immediate expansion of the facility is anticipated, but the demand for oils and fats is rising and is expected ultimately to require added capacity. Two additional projects have secured licenses and may build vegetable oil and fat-making facilities in the future.

The Saudi Vegetable Oil and Ghee Company processes soy bean, palm, and corn oil in its fully automated, modern facility, and observes the strictest hygiene standards. Raw oil imports are stored in 20 on-site tanks that have a combined capacity of 15,000 mt. Finished products are packed in 1-gallon plastic bottles, and in 1-kg, 15-kg, and 10-pound cans. The plant has its own can-making operation.

Imports of fats and oils soared in 1980 to 159,000 mt compared to 106,000 mt the year before. However, imports should drop to about 50,000 mt a year as the Saudi Vegetable Oil and Ghee Company establishes itself in the market.

American companies were solicited by Saudi Vegetable but few submitted bids, saying the project was too small. However, several U.S. firm did supply equipment for the project, including two self-cleaning Niagara filters made by Ametek, Inc. and cooling units made by Carrier. The Swedish firm, Karlshamns, has a management contract with Saudi Oil and Ghee. Germany's Kirchfeld constructed the plant and provided much of the equipment for both the plant and its can-making facility.

Beverages.—The Saudi beverage industry is fairly well developed and consisted of 17 plants employing over 2,000 workers at the end of 1980. Twelve of the units have employment levels of over 100, two employ between 50 and 99, and three have less than 50 workers. Combined licensed capacity was 500 million bottles and 400 million cans, or about 250,000 mt a year.

Pepsi-Cola, the largest soft drink maker in the Kingdom, operates two plants in Jidda and one each in Riyadh, Bureida, and Dammam. Other major brands include Coka-K (the local brand that replaced Coca-Cola), Canada Dry, Seven-Up, and Vimto. Soft drink makers have been expanding to meet growing demand. The Saudi Refreshment and Industry Company, which bottles Coka-K, recently added new bottling lines to all three of its plants (one each in Jidda, Riyadh, and Dammam). Pepsi added a new production line to its Jidda unit, an extra canning line to its Riyadh plant, and two new bottling lines and one canning line to its Dammam facility. The Jidda Seven-Up bottler replaced its old line with a new one.

Local soft drink makers are intent on replacing imported products, which come mostly from Japan and the United States. Substantial Government subsidies and the possibility of a hefty import duty have succeeded in sharply reversing the trend of growing soft drink imports. To satisfy local demand, most plants now have automated canning lines and have beefed-up production capacity. Nine new soft drink plant licenses were issued in 1981, representing a combined potential capacity of 800 million units a year. The soft drink import substitution effort is leading to sector expansion. Canada Dry plans to open a factory in Jidda soon. The firm is looking for a 250-cubic-centimeter (cc) can supplier for its new Holstein-Kappert (German) canning line. All other Saudi soft drink canners currently use the standard 3-piece, 296 cc can, while most imports come in 2-piece, 250 cc cans. Trade sources report that, because canned carbonated soft drinks are popular, other companies can be expected to add more canning production lines.

The level of technology among soft drink makers is quite high. The oldest production line in Saudi Arabia is the one installed by Canada Dry in its Jidda plant in 1975. Bottling lines are usually semiautomatic, while canning lines tend to be fully automatic. All new plants are turnkey projects, and the equipment used is usually selected by the contractor. At one time, the U.S. suppliers dominated the beverage equipment sector, but U.S. sales in this market have decreased. Trade sources forsesee American equipment manufacturers encountering difficulties in holding their share of the beverage equipment market. Many Saudi soft drink makers have turned to German suppliers, notably Ottmann and Herbst and Noll Minden. Even so, Saudi Fruit Juice and Beverage Industry in Jidda is satisfied with its two American canning lines. In an effort to attract business, Mitsubishi of Japan is trying to establish an experimental canning line, but to date, they have not succeeded in closing any sales.

Health or mineral water bottling is on the rise in response to tremendous domestic demand. Imports expanded significantly over the 3-year period ending in 1980, up to 152,000 mt from only 42,000 mt in 1977. Nine new licenses were issued in 1981 to water bottlers, which will greatly add to the existing 135-million-liter capacity (about 90 million bottles) of the Kingdom's three plants. The new plants will have a combined annual capacity of 120 million liters, which is expected to put a damper on imports.

Nonalcoholic beer is increasingly selected as a beverage of preference by Saudi consumers. There are no domestic producers, however, and no projects are planned for the foreseeable future. Imports rose threefold between 1977 and 1980, to 27,000 mt.

Fish and seafood.—Although the waters surrounding Saudi Arabia are abundant with fish, this resource has not been fully exploited. While the 1980 catch was only 16,000 mt, the Government estimates that improved fishng techniques could increase the annual yield to as much as 500,000 mt. Closely following the recommendations of a Saudi fishing industry study conducted by the United Kingdom's White Fish Authority in 1980, improved fishing methods are being introduced. Many existing fishing vessels have been modified, and a number of new boats have been purchased. In addition, docking facilities have been constructed, and better marketing techniques have been implemented. These improvements are expected to boost the current annual catch by up to 35,000 mt and to encourage annual seafood consumption, which now is a now 2.3 kg per capita.

The country's only fish processing operation, Saudi Fisheries Company, also catches and markets fish. Some 40 percent of the company's $30 million of equity capital was contributed by the Government, and the rest was provided by private Saudi investors. Saudi Fisheries has a single processing factory in Dammam and an annual capacity of 4,000 mt. The factory's equipment includes an American shrimp processing line and a Swiss Multivac packaging unit. Total cold storage capacity is about 20 mt a day. All packing is done by hand.

American consultants employed by the company anticipate modest market growth of about 12,000 mt of processed fish a year. A processing facility capable of handling around 2,000 mt per year is being built in Jizzan, and trade sources say that plant will be experimenting with smoking and salting. According to industry analysts, American equipment could be given preference, if some problems are addressed: seafood processors expect U.S. vendors to offer more competitive prices and develop a better understanding of the Middle Eastern seafood market.

Miscellaneous food products.—Several kinds of miscellaneous food products are manufactured in Saudi Arabia, including snacks, macaroni, halawa (a sweet made from sesame seeds), and tahina (sesame seed paste). The industry is characterized by small- and medium-sized plants.

At the end of 1982, there were five snack food factories with a combined capacity of 1,835 mt and a workforce of 95. Local industry development is fairly recent and has been assisted by Government loans. One of the companies, Tasali Snack Food Company in Jidda, entered into a license agreement with Scudders, a U.S. firm. Another company, Al-Basam, plans to make potato chips on its own. This firm bought its processing equipment from Britain's Salvo & Right Machinery, explaining that it preferred U.S. equipment but couldn't find a supplier.

Most existing facilities are underutilized, and expansion plans are uncertain at the moment. Moreover, the Saudi Government has decided that there are enough local snack makers for the time being and is refusing to accept new applications for development loans.

Saudi Arabia has four macaroni plants, two each in Jidda and Mecca with a total licensed capacity of 5,000 mt. The Radwan and Basam macaroni factory in Jidda is the only one of the four plants employing over 50 workers.

An affiliate of Italy's Industrial Buitoni Perugina, the Jidda plant was established in mid-1981 in an effort to reduce the rising distribution costs that were eating away the market's already low profit margins and were endangering Buitoni's position as the market leader. Operating near its full capacity of 3,500 mt, the factory is estimated to have more than a 30 percent share of the pasta market. Buitoni supplied the pasta-making equipment and also has a management contract with the local plant. At present, operations are semiautomated, but this situation is expected to change. To boost production, full automation will be necessary. Trade sources predict that the company will soon offer Buitoni's full line of pasta products, all made locally, and will increase its market share to at least 50 percent.

A license was granted in 1981 for a Riyadh macaroni factory with a 2,150-mt capacity and a $2.7 million capital investment. Future prospects for additional macaroni production appear limited.

As of 1981, there were seven firms producing halawa and tahina, with a combined capacity of almost 17,000 mt. In the same year, the Government issued licenses for construction of three more plants, representing a total capacity of 3,800 mt and a overall capital investment in excess of $4 million.

The only Saudi salt refining plant, located in Jidda, was established in 1978. It uses German equipment but has plans to expand capacity using Italian equipment supplied by Metalotechnica, a subsidiary of Pianelli and Traversa. The plant decided to switch suppliers because of dissatisfaction with the German firm's prices and followup. The refining plant has a licensed annual capacity of 25,000 mt, which is sufficient to satisfy both local demand and some exports to neighboring countries.

Other miscellaneous food products manufactured in Saudi Arabia include starch and yeast. New licenses have been issued to the Starch and Glucose National Company and to the Saudi Yeast Factory. The starch plant will produce 2,000 mt of starch and 20,000 mt of glucose annually, while the latter operation is expected to process 4,500 mt of yeast each year. Combined capital investment for the two projects is about $26 million.

Trade and Technical Regulations

The trade policy of Saudi Arabia liberal and free-enterprise oriented. There are no exchange restrictions and few limits are imposed on trade. This situation has resulted from the coincidence of an ample supply of foreign exchange, a stable currency, and an economy still largely dependent on imports for development.

Nevertheless, certain imports are prohibited, including alcoholic beverages and pork products. Saudi Arabia prohibits trade with South Africa. It also participates in the Arab League economic boycott against Israel. Not only does Saudi Arabia prohibit direct trade with Israel, but it also subscribes to the secondary boycott against third-country firms found to have certain economic relationships with Israel. In general, normal trade dealings are unaffected by the boycott, and many U.S. firms successfully sell to both Israel and Saudi Arabia.

Saudi Arabia's latest (June 1977) tariff book classifies goods according to the unified nomenclature of the Arab League, which is essentially the international Customs Cooperation Council Nomenclature (CCCN), formerly Brussels Tariff Nomenclature (BTN), system.

More than half of all items are exempted from customs duties entirely, including most equipment needed for development projects. Nearly all the remaining items are dutiable at 4 percent *ad valorem.*

The Government recently imposed duties on certain beverage imports and is contemplating other possible tariffs on food and beverage imports. The Kingdom follows a policy of free trade and has no foreign exchange restrictions. Though the Saudis are hard at work developing national equipment standards, no such standards are expected to be implemented for food processing or packaging machinery anytime soon. Equipment complying with internationally accepted technical standards is considered adequate by local buyers.

Food processing and packaging equipment is generally sold directly to end-users by manufacturers. There are virtually no agents or distributors of food processing or packaging machinery. However, Badr Automatic runs an agency for Werner & Pfleiderer bakery equipment; the operation seldom solicits business but offers advice and contacts suppliers for prospective equipment buyers.

Saudi businessmen frequently do not recognize the names or reputations of otherwise well-known companies. Instead, they tend to deal with individuals as if they were independent of the concerns they represent. Therefore, consistent personal support from equipment sellers is necessary before deals may be struck.

Additional Information

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The Survey summarizes a 300-page International Market Research (IMR) report prepared by Middle East Marketing Research Bureau in Cyprus under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Saudi Arabia and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agent and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
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When placing an order for this research, please request "The Market for Food Processing and Packaging Equipment in Saudi Arabia," ITA 82-08-508, April 1982.

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The Saudi medical equipment market, despite declining oil export earnings, is expected to continue its rapid growth through 1985, increasing an average 13 percent a year to $153 million[1] (see table 1). The Saudi Government, concerned with large-scale migration into urban areas, is giving national health care a high priority in the Third Development Plan (1981-85), which calls for the allocation of $10 billion to establish a basic, comprehensive, nationwide health care system. This priority remains in the new 1983-84 budget, released April 13. While construction projects may be slowed, the Plan's 1985 targets for hospitals and beds remain and expenditures for equipment and supplies will not abate—this despite a 22 percent cut in the overall Saudi budget this fiscal year (April to April). Continuing strong demand for U.S. medical equipment—though not at 1981 peak levels—is reflected in the latest export statistics from the U.S. Bureau of the Census (see tables 2 and 3).

National health care was largely ignored before 1975 as the Government concentrated on developing infrastructure and oil-related industries. With the rapid growth of Saudi Arabia's oil wealth, however, the Government was able to turn its attention to health care, swelling the medical equipment market from $25 million in 1975 to $84 million in 1980, an annual average growth of 27.5 percent. Growth would have been even more rapid, but the 5-year health plan was too ambitious, and several projects were canceled or postponed. A continuing shortage of skilled manpower, especially of medical technicians and doctors, will again limit the industry's absorptive capacity and constrain market growth through 1985.

Although heart disease is not the major health problem in Saudi Arabia that it is in the United States, the market for cardiology equipment is expected to rise rapidly. All new hospitals will be installing coronary care facilities, and most existing hospitals need to upgrade generally substandard equipment. The Government's ambitious hospital construction program should boost sales of operating room equipment, including top-of-the-line surgical products. To combat high infant-mortality rates, hospitals are expected to increase purchases of pediatric equipment. Rapid growth is also foreseen for architectural, transportation, and mobility equipment as well as rehabilitation products, but from very low market levels.

Table 1.—Saudi Arabia: Estimated market for medical equipment, by application area, 1979-81, and projected 1985[1]

(in millions of U.S. dollars)

	1979	1980	1981	1985
Cardiological equipment	2.0	2.3	2.5	5.0
Pulmonary apparatus	3.5	3.8	4.1	5.5
Neurological equipment	2.0	2.4	2.8	4.0
Ophthalmological equipment	3.0	3.3	3.6	5.5
Pediatric equipment	2.8	3.2	3.7	6.5
Renal equipment	2.5	2.8	3.1	4.5
Operating room equipment	5.5	5.8	6.7	12.0
General hospital equipment	30.5	33.9	37.2	54.5
Clinical laboratory equipment	10.0	11.2	12.4	22.0
Miscellaneous health care equipment	4.0	4.5	5.0	7.0
Disposables	5.0	5.8	7.0	14.5
Orthotic and prosthetic equipment	.8	1.0	1.2	2.5
Architectural, transport, and mobility equipment	.6	.7	.9	2.0
Physical and occupational therapy equipment	2.0	2.3	2.6	4.5
Sensory aids and adaptive systems	.8	1.0	1.2	2.5
Total	75.0	84.0	94.0	152.5

[1] Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Source: Official Saudi Arabian import statistics, official exporter country statistics, and International Trade Administration, Office of Trade Information Services market research study (see Additional Information box).

Hospitals, most of which are understaffed, are beginning to be interested in monitoring equipment and automation to reduce high labor costs and manpower needs. However, computer usage in the Saudi medical field has been limited by the scarcity of trained technicians. Suppliers can anticipate sales of minicomputers performing specific tasks, with imports of larger patient care systems picking up toward the middle of the decade.

In its current health plan, the Government has shifted emphasis from curative to preventive medicine. Receiving more attention will be improvements in environmental health, including more sanitation programs, and primary care, including increased expenditures on permanent and mobile health care centers. The largest government buyer, by far, is the Ministry of Health (MOH), though other smaller end-users, such as university medical institutions, specialized medical institutions, military hospitals, and health care centers, are slated to increase expenditures on equipment, supplies, and furniture at about the same rate as the

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[1] All values are shown in U.S. dollars. Local currency is converted at the following exchange rates: US$1=SR3.33 (1979 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars.

Table 2.—Saudi Arabia: Exports of medical equipment from the United States, 1978-82

(in thousands of U.S. dollars)

	1978	1979	1980	1981	1982	Percentage change 1978-82	Percentage change 1981-82
Medical instruments							
Pacemakers	4	32	22	—	77	1,825.00	0.00
Diathermy units	3	2	3	3	5	66.67	77.67
Ultrasonic therapeutic devices	38	5	17	107	159	318.42	48.75
Other therapeutic apparatus	153	580	281	861	1,268	727.52	47.28
Electrocardiographs	40	13	46	73	47	17.50	-35.28
Electroencephalographs				61	45		-27.24
Complete patient monitoring systems	1,514	153	325	1,027	1,692	11.79	64.75
Electromedical apparatus, NSPF	2,082	2,069	5,832	17,258	7,932	281.08	-54.04
Electromedical apparatus parts	424	748	686	1,567	2,068	387.64	32.00
X-ray tubes		4	19	35	96		176.88
Parts for X-ray tubes		6	4	57	5		-91.29
X-ray apparatus & parts for medical or dental use	1,427	448	826	4,211	2,711	89.94	-35.62
Radiological apparatus & parts for medical or dental use	473	31	323	46	353	-25.43	666.38
Ophthalmic instruments & appliances & parts	349	75	646	6,710	1,993	471.27	-70.29
Anesthetic apparatus & instr. & pts. (exc. syringes)	221	60	491	313	178	-19.22	-43.08
Bougies, catheters, drains, & soundes & parts	724	647	932	1,242	1,071	47.89	-13.80
Basal metabolism & blood pressure apparatus, & parts	176	172	39	134	215	22.67	60.87
Hypodermic syringes, & parts	143	196	350	781	1,240	769.84	58.79
Other syringes, & parts, NSPF	196	243	298	191	201	2.12	4.90
Other medical, etc. instruments & apparatus, & parts, NSPF	4,473	4,638	5,345	9,621	14,783	230.48	53.65
Subtotal	12,440	10,122	16,485	44,298	36,139	190.51	-18.41
Medical and hospital appliances and equipment							
Sterilizers & autoclaves & parts	532	408	241	984	986	85.34	0.20
Wheelchairs, & parts	39	221	222	123	463	1,087.18	276.42
Other hospital, medical, dental, etc. furniture, NSPF	5,347	5,320	14,980	15,298	10,676	99.66	-30.20
Mechanotherapy appliances & massage apparatus, & parts	739	1,144	1,172	724	737	-0.29	1.73
Artificial respiration, ozone, oxygen, aerosol therapy etc.	1,665	1,206	1,978	—	—		0.00
Artificial respiration, NSPF	—	—	—	2,305	1,771		-23.15
Hearing aids & parts, NSPF	84	4	43	97	55	-34.51	-43.06
Bone & joint prosthesis, plates, screws, nails, etc.	19	51	27	229	544	2,763.16	137.80
Other orthopedic appliances	193	231	893	1,719	1,813	838.18	5.46
Subtotal	8,618	8,585	19,556	21,479	17,045	97.78	-20.63
Medical supplies							
Opacifying prep. for radiological exam.	6	8	17	3	28	366.67	833.33
Other diagnostic agents (exc. biological) NSPF	313	531	837	1,865	2,517	704.15	34.96
Waddings, gauze, dressings, etc. w/medicinals	655	475	445	314	144	-78.01	-54.13
Other waddings etc. NSPF	196	363	444	836	948	383.67	13.40
Surgical sutures & materials etc., sterile	142	163	378	320	216	52.11	-32.49
Surgical and medical gloves	59	254	222	304	748	1,167.80	146.05
Hypodermic needles	15	52	160	93	147	880.00	58.69
X-ray film, medical, exc. dental	858	128	252	1,008	101	-88.22	-89.97
Other X-ray film	56	31	167	137	158	182.14	15.33
Contact, ophthalmic lenses not mounted	—	—	4	—	1	0.00	
Other ophthalmic lenses	19	46	31	35	38	101.16	8.57
Eyeglass, etc. frames, mountings & parts	17	—	—	—	—	-100.00	0.00
Eyeglass fronts & temples	—	6	33	—	9	0.00	
Parts, NSPF, for eyeglasses, lorgnettes, goggles, etc.	—	1	34	71	41	0.00	
Subtotal	2,336	2,058	3,024	4,986	5,096	118.15	2.21
Total	23,394	20,765	39,065	70,763	58,280	149.12	-17.63

NOTE: In 1981, artificial respiration (sch B 7094500) was broken into two new Sch B categories, with gas masks for aviation purposes going into a separate number (no longer part of medical group) and artificial respiration for medical therapy becoming 7094540.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.—Saudi Arabia: Exports of medical equipment from the United States, 1982 by quarters and January-February 1982 and 1983

(in thousands of U.S. dollars)

	1982					
	January-March	April-June	July-September	October-December	January-1982	February 1983
Medical instruments						
Pacemakers	—	32	8	37	—	8
Diathermy units	—	—	—	5	—	—
Ultrasonic therapeutic devices	30	24	29	76	30	4
Other therapeutic apparatus	307	345	104	511	254	256
Electrocardiographs	10	2	35	1	10	—
Electroencephalographs	15	—	30	—	—	—
Complete patient monitoring systems	414	330	855	93	205	520
Electromedical apparatus, NSPF	2,644	1,580	1,291	2,417	2,310	1,007
Electromedical apparatus parts	244	733	723	367	178	345
X-ray tubes	—	11	49	36	—	16
Parts for X-ray tubes	5	—	—	—	—	1
X-ray apparatus & parts for medical or dental use	338	861	688	825	148	1,506
Radiological apparatus & parts for medical or dental use	11	35	42	265	3	38
Ophthalmic instruments & appliances & parts	991	816	142	44	729	54
Anesthetic apparatus & instr. & pts. (exc. syringes)	29	32	44	74	28	96
Bougies, catheters, drains, & soundes & parts	245	294	226	306	158	141
Basal metabolism & blood pressure apparatus, & parts	32	73	68	42	28	17
Hypodermic syringes, & parts	221	252	384	383	101	201
Other syringes, & parts, NSPF	18	31	132	19	13	177
Other medical, etc. instruments & apparatus, & parts, NSPF	2,136	3,287	5,568	3,792	1,593	2,531
Subtotal	7,690	8,738	10,418	9,293	5,788	6,918
Medical and hospital appliances and equipment						
Sterilizers & autoclaves & parts	169	413	179	224	158	85
Wheelchairs, & parts	151	30	5	277	128	51
Other hospital, medical, dental, etc. furniture, NSPF	2,356	3,502	1,589	3,229	1,842	1,966
Mechanotherapy appliances & massage apparatus, & parts	90	354	189	104	58	70
Artificial respiration, ozone, oxygen, aerosol therapy etc.					—	—
Artificial respiration, NSPF	669	302	237	564	234	945
Hearing aids & parts, NSPF	51	—	—	4	48	1
Bone & joint prosthesis, plates, screws, nails, etc.	81	30	19	415	42	68
Other orthopedic appliances	469	454	297	593	390	767
Subtotal	4,036	5,085	2,515	5,410	2,900	3,953
Medical supplies						
Opacifying prep. for radiological exam.	6	3	7	12	5	4
Other diagnostic agents (exc. biological) NSPF	365	569	624	959	261	537
Waddings, gauze, dressings, etc. w/medicinals	10	67	36	31	4	36
Other waddings etc. NSPF	325	204	165	254	233	208
Surgical sutures & materials etc., sterile	9	57	73	77	6	163
Surgical and medical gloves	126	148	303	170	95	108
Hypodermic needles	17	71	29	31	16	15
X-ray film, medical, exc. dental	58	8	29	6	58	—
Other X-ray film	113	—	40	5	58	7
Contact, ophthalmic lenses not mounted	1	—	—	—	1	9
Other ophthalmic lenses	—	31	6	1	—	15
Eyeglass, etc. frames, mountings & parts					—	—
Eyeglass fronts & temples	4	—	2	4	4	—
Parts, NSPF, for eyeglasses, lorgnettes, goggles, etc.	3	32	5	1	2	—
Subtotal	1,037	1,190	1,319	1,551	743	1,102
Total	12,763	15,013	14,252	16,254	9,431	11,973

Source: Compiled from official statistics of the U.S. Department of Commerce.

MOH (see table 4). On the other hand, medical equipment purchases originating from the private sector are expected to stagnate through 1985. Increasing competition in urban markets that have reached or are fast approaching saturation should hold spending down despite government policies designed to encourage private investment.

Competitive Assessment

Despite the growing size of the medical equipment market, Saudi Arabia has almost no domestic production of medical equipment or disposables. A few local companies have applied for manufacturing permits, but high plant construction costs and the need to import labor discourage this kind of investment, and domestic production is not expected to grow significantly.

Since the 1977 initiation of the Saudization policy, which gives preference to local companies with at least 50 percent Saudi participation, foreign companies are increasingly recruiting Saudis when establishing local companies. However, such joint ventures are most effective when a foreign firm assigns its own people to them. Commercial success also depends on choosing local agents with good contacts. Agents handle most of the sales for small projects and for replacement equipment.

In addition to previous action taken by the Government to protect local firms, a recent royal decree calls for foreign contractors to subcontract at least 30 percent of contract execution to 100 percent Saudi contractors. This would not include joint ventures which the Government is encouraging in a number of sectors including the manufacture of disposables in the medical field.

U.S. companies should also cultivate relations with other foreign commercial firms, such as hospital consultants, contractors, and hospital management firms. They can be of invaluable assistance and are sometimes a direct source of contracts. About 55 percent of Saudi medical imports are through turnkey constructors. Nearly all projects are designed by foreign consultants, who are thus in a strong position to influence the awarding of contracts. Small or medium-sized companies can also benefit from joining forces with larger, established firms that offer complete packages of equipment to Saudi buyers.

End-users place great importance on technology, performance ratio, training, service, and manpower backup. Price and payment/credit terms, on the other hand, have been marginal considerations, but as the market becomes more competitive these factors will increase in importance.

U.S. suppliers.—American producers, the second largest suppliers of the Saudi medical equipment market during 1975-80, should be able to maintain a 20-25 percent market share through 1985. U.S. products are highly competitive in terms of technology, quality, and price, in those market sectors forecast to grow the fastest. As a result, imports from U.S. companies are expected to increase from $19 million in 1979 to $35 million in 1985 (in constant 1980 dollars) (see table 5). U.S. Census statistics through February 1983 (see tables 2 and 3) show the following leading exports: medical and surgical instruments which tripled in value from 1978 to 1982 and continued to grow in 1983; medical furniture which doubled in value from 1978 to 1982, though the two top years were 1980 and 1981; and electromedical apparatus which spurted up in 1981 and returned to a more steady growth rate in 1982.

Table 4.—Saudi Arabia: Expenditures for medical equipment, supplies, and furniture by major users sectors, 1980 and projected 1985
(in millions of U.S. dollars)

	1980			1985		
	Equipment	Supplies[1]	Furniture	Equipment	Supplies[1]	Furniture
General hospitals	49.0	110.0	16.0	90.0	250.0	30.0
University medical centers	4.0	9.0	1.5	7.0	30.0	3.0
Specialized medical institutions (e.g. cancer clinics)	4.0	7.0	1.0	7.0	25.0	3.0
Military hospitals	15.0	33.0	4.5	27.0	80.0	10.0
Clinical laboratories	3.0	4.0	1.0	5.0	10.0	1.5
Mobile and permanent health care/population screening centers	7.0	5.0	1.0	13.0	15.0	2.0
Physicians (private practitioners)	2.0	2.0	1.0	3.0	5.0	1.5
Total	84.0	170.0	26.0	152.0	415.0	51.0

[1] Includes disposables.

Source: See source notation of table 1.

Table 5.—Saudi Arabia: Extimated imports of medical equipment, by application area, 1978, 1979, and projected 1985

(in millions of U.S. dollars)

	1978		1979		1985	
	Total Imports	From U.S.	Total Imports	From U.S.	Total Imports	From U.S.
Cardiological equipment	1.5	.4	2.0	.3	4.0	1.0
Pulmonary apparatus	3.2	1.7	3.5	1.2	6.0	1.3
Neurological equipment	1.6	.7	2.0	.9	4.0	1.4
Ophthalmological equipment	2.8	.4	3.0	.2	5.5	.8
Pediatric equipment	2.1	.6	2.8	1.1	6.5	1.8
Renal equipment	2.3	.5	2.5	.6	4.5	1.0
Operating room equipment	4.8	1.4	5.5	1.3	12.0	2.6
General hospital equipment	25.6	6.4	30.5	5.3	54.5	9.0
Clinical laboratory equipment	8.2	2.8	10.0	3.6	22.0	7.0
Miscellaneous health care equipment	4.0	1.8	4.0	1.7	7.0	2.0
Disposables	3.0	.6	5.0	1.2	14.5	3.5
Orthotic and prosthetic equipment	.6	.2	.8	.2	2.5	.6
Architectural, transportation, and mobility equipment	.4	.1	.6	.2	2.0	.5
Physical and occupational therapy equipment	1.5	.9	2.0	1.1	4.5	2.0
Sensory aids and adaptive systems	.5	.1	.8	.2	2.5	.5
Total	62.1	18.6	75.0	19.1	152.0	35.0

Note: This table does not include hospital and medical furniture.

Source: See source notation of table 1.

In the past, U.S. medical equipment suppliers used the influence of U.S.-trained medical staff and U.S. consultants and health care specialists in Saudi Arabia to obtain a number of contracts for the design, construction, equipping, and management of many hospitals. However, as the presence of these groups diminished, U.S. companies became less successful, dropping from a 35-percent share of the market in 1975 to 24 percent in 1979. Only a small number of American sales representatives were stationed locally.

U.S. firms interested in capturing a greater share of the Saudi market will have to market their merchandise more aggressively. They must offer products that perform for long periods with little maintenance or special attention; this is a definite plus in a country where equipment breakdown due to faulty maintenance or operation is frequent. Aftersales service is also extremely important. Saudi end-users consider U.S. firms particularly remiss in this respect. Future sales prospects can also be enhanced by personnel training. American firms have a good reputation for this; some companies train Saudis in the United States, often paving the way for additional contracts in the future.

U.S. companies have acquired several management and procurement service contracts recently, and dominate the major hospitals market though competition for these contracts is expected to grow. A leading company in this market, National Medical Enterprises, Inc. (NME), obtained in 1979 a $150 million contract to manage the Ministry of Defense and Aviation's (MODA's) medical services and to act as an agent for disbursing a $850 million fund earmarked for health needs. In 1980 NME secured a $1 billion 5-year contract to manage the Al-Hada hospital near Taif and a $31 million letter of intent to provide recruiting, management, consulting, purchasing, data processing, and training services for a new 100-bed hospital in Dhahran. Other important companies include Whittaker Corporation, which early this year signed a fourth extension, running to 1986, to supply and manage several hospitals for MODA, Hospital Corporation of America Service and Supply, and Hospital Affiliates International.

Third-country suppliers.—German companies have combined quality products with an aggressive marketing approach to become Saudi Arabia's largest supplier of medical equipment—a position they are expected to maintain over the next 5 years. Their high market share is principally due to their dominance in the radiological equipment market where Siemens is the major factor. In 1978 they captured 40 percent of the market and, in 1979, 35 percent. German firms particularly excel in aftersales service.

U.K. companies, hurt by the falling price/performance ratio of their products, have experienced a drop in sales since 1975 when they led all foreign suppliers. Their market share, 10-15 percent in 1980, is expected to average less than 10 percent during 1981-85. According to Saudi buyers, the quality of British equipment, especially electromedical and computer-based equipment, has fallen behind the standard set by other major suppliers.

Japanese companies are the up-and-coming suppliers of the Saudi market. Their 1979 sales of a broad range of high-quality medical equipment approached $5 million.

Specific Product Markets

Cardiological equipment.—Purchases of cardiological equipment are expected to increase an average 16.8 percent a year through 1985. Hospital administrators are seeking to alleviate the problem of staff shortages through acquisition of intensive care systems, both central and bedside. With imports forecast to grow at an average rate of 22 percent a year through 1985, U.S. companies should supply a larger share of this equipment. Two U.S. companies, Hewlett-Packard Co. and Ohio Medical Products Division, have made large sales of cardiological equipment. The German firm Hellige (Litton subsidiary) and the British firm Cambridge Medical Instruments, Ltd. have sold electrocardiographs (ECG's) which some hospitals still lack. Expenditures should thus increase for basic ECG equipment (see table 6). Saudi medical facilities have just begun to use cardiac output analyzers with computers and more are expected to be obtained in the near future.

Pulmonary apparatus.—The market for pulmonary equipment amounted to $3.8 million in 1980, and with an 8-percent average annual growth forecast, should reach $5.5 million in 1985. Ohio Medical, Hewlett-Packard, and the German company Jaeger have sold this equipment in the past, but U.S. companies are expected to supply only a small part of Saudi needs, which range from basic to highly advanced equipment. A number of hospitals use positive pressure breathing machines and resuscitation devices, but the larger hospitals are beginning to use the more sophisticated volume-controlled breathing machines. A growing market is predicted for simple respiratory equipment, used in the proliferating health care centers and district hospitals. The expansion of ambulatory service should boost demand for mobile reanimation units. Purchases of conventional inhalation devices are expected to continue despite the plans of some clinics to replace these with nebulizers and, in some cases, ultrasonic nebulizers.

Neurological equipment.—Most of the major hospitals are already equipped with electroencephalographs (EEC's); and, until more doctors are trained to perform neurosurgery, they will tend to require little neurosurgical instrumentation. The market is expected to mount from $2.4 million in 1980 to $4 million in 1985, with increasing use of sophisticated EEC's and encephaloscopes foreseen. Cambridge Medical Instruments, Ltd. of Britain is a leading supplier.

Table 6.—Saudi Arabia: Imports of medical equipment by country of origin, 1978, 1979, and projected 1985

(in thousands of U.S. dollars)

	1978	1979	1985
Medical/surgical, electromedical, diagnostic, opthalmic apparatus (90.17)			
United States	9,810	9,300	16,000
Germany	9,484	9,988	
United Kingdom	3,363	6,514	
Japan	1,766	3,609	
All other	2,746	7,754	
Total	27,169	37,165	65,000
Electrocardiographs (90.17.01)			
United States	40	13	600
Germany	240	1,094	
United Kingdom	35	128	
Netherlands	9	36	
All other	30	108	
Total	354	1,379	3,600
Other electrodiagnostic instruments (90.17.05)			
United States	1,514	153	1,500
Germany	9	575	
France	5	500	
United Kingdom	4	300	
All other	182	1,035	
Total	1,714	2,563	5,200
Other electromedical equipment (90.17.21)			
United States	2,506	2,817	4,800
Germany	1,733	1,300	
France	—	600	
United Kingdom	295	444	
All other	330	1,119	
Total	4,864	6,280	13,000
Syringes and cannulae (90.17.70)			
United States	515	611	800
Japan	1,218	1,285	
Italy	103	184	
United Kingdom	137	163	
All other	294	300	
Total	2,267	2,543	4,200
Other medical instruments (90.17.90)			
United States	4,473	4,638	8,300
United Kingdom	2,854	5,295	
Germany	932	3,895	
Japan	478	1,975	
All other	1,510	3,544	
Total	10,247	19,347	39,000

Table 6.—Saudi Arabia: Imports of medical equipment by country of origin, 1978, 1979, and projected 1985—Continued

	1978	1979	1985
Mechano-therapy and respiratory appliances (90.18)			
United States	2,404	2,350	3,600
Germany	1,000	1,530	
Italy	35	370	
Japan	160	205	
United Kingdom	445	140	
All other	252	790	
Total	4,296	5,385	10,000
X-ray apparatus (90.20)			
United States	1,900	489	2,000
Germany	7,814	8,079	
Italy	1,700	934	
United Kingdom	588	840	
Japan	210	805	
All other	1,050	1,415	
Total	13,262	12,562	21,000
Instruments and apparatus for physical and chemical analysis (90.25)			
United States	1,270	1,690	3,000
Germany	510	964	
United Kingdom	503	415	
Japan	35	85	
All other	85	165	
Total	2,403	3,319	7,500

Source: Official exporter country statistics, official Saudi Arabian import statistics, industry and professional trade estimates.

Ophthalmological equipment.—Purchases of ophthalmological equipment are expected to grow an average 11 percent a year through 1985, as the Saudi Government tries to reduce the incidence of blindness, believed to be the second highest in the world. Market growth should enable U.S. companies, such as American Optical Corp. and Bausch & Lomb, to increase their total sales from $400,000 in 1978 to $800,000 in 1985. Olympus of Japan has also sold advanced optical products. Foreign manufacturers can look forward to rising sales for meridional and automated objective refractometers and photocoagulators. Demand for simple paramedic equipment, including vision testing systems, is predicted to rise as health care is extended to the rural areas and local neighborhoods of cities. In addition, the many new hospitals that will be opening during the next few years are expected to buy ophthalmoscopes. A new, potentially promising product is the ophthalmic laser, acquired by the King Khalid University Hospital in Riyadh and the Maghrabi Ophthalmic Hospital in Jeddah. The Ministry of Health has also directed Saudi hospitals to refer difficult cases to the new King Khalid Eye Hospital rather than hospitals abroad.

Pediatric equipment.—The outlook for pediatric equipment is bright, with sales predicted to climb an average 15 percent a year to $6.5 million by 1985. Hospitals have purchased pediatric equipment from Air-Shields, Inc., Ohio Medical, and other American companies, and sales by U.S. firms are projected to reach $1.8 million by 1985. Hospital expenditures are increasing as regional hospitals improve their services, maternity/child clinics are established, and medical facilities in general cope with a rising birth rate. The Government is seeking improvement of infant care, which would require the acquisition of diagnostic equipment, intensive care incubators, resuscitation equipment, and monitoring systems. In the face of high infant mortality rates, emphasis is also being placed on fetal diagnostic imaging equipment.

Renal equipment.—The installation of kidney treatment facilities at all new hospitals should boost the market for renal equipment from $2.8 million in 1980 to $4.5 million in 1985. U.S. company sales, forecast to lag slightly behind market growth, are still expected to amount to $1 million in 1985. Renal disease is believed to be rising in the Kingdom, ensuring continued demand for dialysis systems. Cordis Dow (United States) and Gambro (Sweden) have been active in the dialysis equipment market. Sales of disposable dialyzers, presently quite small, are expected to grow in response to the Government's encouragement of kidney treatment at home. Regenerating dialysis systems should also constitute a growing market.

Operating room equipment.—Though all Saudi hospitals are equipped for at least basic surgery, the market for operating room equipment is restricted by the scarcity of surgeons and other qualified operating room personnel. Special teams of surgeons are often flown in to perform operations, and some 500 Saudis annually seek surgery abroad. Nonetheless, the market for operating room equipment amounted to $5.8 million in 1980 and is expected to reach $12 million in 1985. The shortage of qualified surgical personnel is not blunting Saudi demand for highly advanced surgical equipment — hospitals tend to purchase first and then find the necessary qualified people.

U.S. companies can anticipate sales of $2.6 million a year by 1985. High sales prospects are foreseen for surgical lighting equipment and tables, currently supplied by such U.S. firms as AMSCO and Castle. In upgrading their surgical capabilities, hospitals will require electrosurgical units, special X-ray equipment, and, to a lesser extent, heart-lung machines. Ohio Medical and the German company Draeger are important suppliers of complex anesthesia equipment—including anesthetic gas evacuation systems. Larger hospitals will be seeking electrocoagulation generators and, for the growing number of intensive care units, blood flowmeters, blood pressure monitors, and blood volume analyzers/monitors. American Optical Corp. has provided Saudi hospitals with defibrillators and blood pressure monitors. Air-Shields, Inc. has sold suction equipment for use with vacuum piping systems. This kind of equipment will be acquired mostly by smaller hospitals and clinics. Other suppliers of surgical equipment include Heine Optotechnik GmbH. (Germany), Downs Surgical (United Kingdom), and Nagashima Medical Instrument Co., Ltd. (Japan).

General hospital equipment.—Sales of general hospital equipment, which totaled $34 million in 1980, are projected to increase an average 10 percent a year through 1985 as new hospitals and local health clinics are outfitted with imported equipment. U.S. company sales should average 9-percent growth per annum. Equipment needed ranges from simple to highly sophisticated. Local health care centers require uncomplicated equipment suitable for a paramedical staff, while larger hospitals with more advanced capabilities are looking for the most up-to-date equipment.

Purchases of modern X-ray equipment, already considerable, will be spurred by a growing concern over radiation dangers from older equipment. German companies, most notably Siemens, provide 64 percent of Saudi Arabia's imported radiology equipment. Other suppliers of X-ray equipment include Kodak Co. and Physio-Control of the United States, GEC Medical Equipment of the United Kingdom, Philips of the Netherlands, Shimadzu Seisakusho Ltd. of Japan, and CGR of France.

Several doctors prefer ultrasonic equipment to X-ray machines. Ultrasonic physiotherapy equipment is also on hospitals' shopping lists. Monitoring systems, some computerized, are being increasingly used to counter staff shortages; suppliers include American Optical Corp., Hewlett-Packard, and Litton's German subsidiary Hellige. The priority enjoyed by high-performance autoclaves and thermometry in the past should continue.

The increasing incidence of cancer has caught Saudi hospitals unprepared. Thus, during the next few years, cancer treatment wards will be upgraded and expanded, creating demand for X-ray therapy equipment and computers capable of planning radiation schedules and dosages.

Clinical laboratory equipment.—The new government emphasis on preventive medicine will require more physical examinations and the concomitant increase in laboratory tests, propelling the already sizable market for clinical laboratory equipment from $11.2 million in 1980 to $22 million in 1985. U.S. companies are expected to provide nearly a third of this equipment in 1985. Saudi buyers are looking for both conventional and specialized, highly advanced equipment, sometimes in the same product line. For example, both manual and automated blood counters are used in Saudi Arabia, though the more modern beta and gamma counters are fast gaining dominance. The shift toward advanced equipment is also taking place in the acquisition of ultraviolet spectrometers, gas chromatographs, and "intelligent" analyzers. Blood analyzers have been furnished by Du Pont, Coulter and Beckman of the United States and Hitachi of Japan; microscopes have come from American Optical Corp. and Zeiss of Germany, endoscopes from Storz of Germany (a U.S. subsidiary), chromatographs from Hewlett-Packard, and general laboratory equipment from Reichert of Austria.

Miscellaneous health care equipment.—The market for miscellaneous health care equipment, totaling $4.5 million in 1980, is projected to grow an average 9 percent a year through 1985. Development of a mobile health care service for the rural population should stimuate sales of mobile testing systems, X-ray units for chest surveys, and other mobile laboratory equipment. Computerized multiphasic screening centers will probably be required toward the end of the Third Development Plan. Sales of U.S. products are forecast to reach $2 million by 1985.

Disposables.—The combination of staff scarcity, high labor costs, a substantial rate of waste, mounting awareness of hygienic conditions, and limited concern over price makes Saudi hospitals an ideal market for disposables. The result should be a rapid growth market, increasing from $5.8 million in 1980 to $14.5 million in 1985. Spiraling U.S. sales, averaging 19-percent growth a year, are anticipated through 1985, with biggest import items being syringes, bandages, gloves, and other apparel. Beckton-Dickinson & Co. is the leading U.S. supplier, followed by Johnson & Johnson, American Hospital Supply, Stryker, Kendall Co., Puritan-Bennett Corp., and Ethicon. Disposables have also been purchased from the Japanese companies Daikyo and Terumo Corporation and the Swedish firm LIC.

Orthotic and prosthetic equipment.—Rehabilitation of the handicapped is undeveloped in Saudi Arabia, and it will be a number of years before the necessary skills and facilities are developed to treat complicated surgical and therapeutic cases. The small market for orthotic and prosthetic equipment ($1 million in 1980) is growing at a rapid 20-percent average annual rate and is expected to reach $2.5 million in 1985. Sales would grow even faster except for the shortage of facilities and staff to use the equipment. Purchases of U.S. products are expected to triple, from $200,000 in 1979 to $600,000 in 1985.

Most artificial implants imported from abroad are pacemakers, 60 of which are used every year. In keeping with past purchasing practices, hospitals are not expected to buy other artificial organs in quantity.

Architectural, transportation, and mobility equipment.—The need for architectural, transportation, and mobility equipment, largely ignored in the past, is finally receiving some attention. The market, $700,000 in 1980, consists mostly of wheelchairs, although other kinds of equipment to aid people with impaired mobility are also sorely needed, U.S. companies can look forward to selling $500,000 worth of this equipment in 1985, a quarter of the projected market.

Physical and occupational therapy equipment.—Saudis are shedding old attitudes and developing an awareness of the need to help the handicapped, who constitute a sizable group. The Government is planning four new comprehensive rehabilitation centers for adults and two centers for children in the 1981-85 period. These facilities will all require equipment for physical therapy, boosting the market from $2.3 million in 1980 to $4.5 million in 1985. The ambitious occupational therapy and training program is still to be implemented, with a new labor law paving the way. It stipulates that companies with 50 workers or more should employ disabled persons for 2 percent of their work force. Past contracts to deliver physical and occupational therapy equipment have gone to U.S. companies Franklin Body and Equipment Corp., Stryker, and Burdick; the British firm Zimmer Orthopaedic (now called OEC Europe Ltd.), and LIC.

Sensory aids and adaptive systems.—Mainly on the strength of hearing aid purchases, the market for sensory aids and adaptive systems reached $1 million in 1980. Imports, including various braille devices, should grow an average 20 percent a year through 1985. U.S. sales should amount to $500,000 in 1985, a 20-percent market share.

Health Care System

Health services are provided free of charge by 13 different government organizations. As of January 1983, there were some 117 general hospitals and 23,500 beds in Saudi Arabia. The Ministry of Health, which accounted for about 60 percent of equipment, supplies, and furniture expenditures in 1980, has primary responsibility for health care. Construction of 20 MOH hospitals at a cost of $1.4 billion, out of a total of 36 hospitals with a capacity of 7,550 beds, is scheduled in the Third Development Plan. In addition, some 70 percent of all doctors in the Kingdom work under MOH (see table 7)—1,600 are general practitioners, 1,440 are medical specialists and 190 dental surgeons. In addition to financing a majority of the general public hospitals, the MOH also supervises the construction of private hospitals and purchases its supplies itself rather than through foreign management companies. . Other government agencies with significant health care roles include the Ministry of Higher Education, responsible for the Kingdom's medical colleges, including four teaching hospitals; the Ministry of Defense and Aviation (MODA) and the National Guard, which operate over 10 hospitals and several clinics with more than 4,000 beds; and the Red Crescent Society, responsible for emergency ambulance and other services.

Table 7.—Saudi Arabia: Ministry of Health physicians by specialty, 1979

	Number	Percent
General	1,600	52.6
Internal medicine	160	5.2
Surgery	250	8.2
Pediatrics	200	6.6
Gynecology	200	6.6
Ophthalmology	130	4.3
Otolaryngology	90	3.0
Radiology	60	2.0
Other	350	11.5
Total	3,040	100.0

Source: International Trade Administration, Office of Trade Information Services market research study.

In its Third Health Plan, the Government has emphasized the expansion of basic health services to rural and urban neighborhood areas throughout the country. This will entail the continued construction of hospitals (see table 8), in addition to improving the efficiency of health care administration and increasing the quality and quantity of medical manpower.

The Saudi health care system is hindered by a lack of coordination. All government organizations involved in health care have their own financial appropriations, staff, and facilities, with the private health care sector constituting an additional independent segment. In an attempt to impose order on health care service, the Government created a National Health Council. Whether it can reign over the fiercely independent MOH and the powerful military health organizations remains to be seen.

Table 8.—Saudi Arabia: Numer of health care facilities and hospital beds by type of institution

Type of health care facility	Number of hospitals 1977	Number of hospitals 1979/80	Number of beds 1977	Number of beds 1979/80
Ministry of Health (MOH)				
General hospital/clinics ...	45	52		
Eye clinics	3	3		
Psychiatric	2	3		
Lepracy centers	1	1		
Fever clinics	5	5		
Total	56	64	10,300	12,525
Special facilities, bilharzia, malaria control, chest disease clinics, mother and child clinics	120	164		
Dispensaries	450	506		
Health centers	320	299		
Total MOH	946	1,033		
Ministry of Defense and Aviation (MODA)				
Hospitals	5	8	1,250	2,160
Clinics	6	10	300	500
National Guard				
Hospitals	1	3	200	1,200
Clinics	3	6	100	320
Other Government Agencies				
Hospitals	6	9	1,800	2,956
Clinics	9	12	160	360
Private				
Hospitals	13	18	760	1,283
Clinics	412	447	800	950
Polyclinics	20	25	120	200
Aramco				
Hospital	1	2	200	500
Total health facilities ...	1,422	1,561	15,990	22,954
Total hospitals	71	92		

Source: International Trade Administration, Office of Trade Information Services market research study.

The MOH itself is undergoing a separate reorganization. It runs 64 hospitals with more than 12,000 beds, about 500 dispensaries, 300 health centers, and some 160 specialized facilities. The Ministry divides the country into six regions—Riyadh, Mecca, Abha, Medina, Dammam and Hail—each headed by a Director of Health Affairs. Reorganization of the Ministry will allow health services in each region to be administered through a hierarchy of facilities consisting of general hospitals in urban communities, specialized hospitals in major cities, and specialized facilities, support services (laboratories, warehouses), health offices, and mobile health services. In addition, dispensaries and health care centers are to be restructured into a new network of primary health care centers.

The sheer scale of Saudi Arabia's manpower shortage militates against any short-term solution and consigns the Government to continued heavy reliance on foreign nationals, especially Pakistani, Egyptian, Palestinian, and British doctors, in order to keep the health care system running. The ratio of doctors to population is a poor 6.7/10,000. Present government plans envisage a 90-percent increase in the number of doctors over the next 5 years. The number of Saudi doctors, who comprise only about 8 percent of total physicians in Saudi Arabia, had been increasing slowly until 1980 when the first class of Saudi-trained doctors graduated. The Kingdom has recently opened three medical schools to accommodate 1,200 students, and a fourth school is under construction. According to the Health Minister, Saudi doctors will comprise half of all physicians by 1995.

However, Saudi women, reluctant to step out of traditional roles, are entering the nursing profession in extremely small numbers. Nor is there any large-scale training of technicians and administrators. The manpower problem, except for doctors, could very well worsen in coming years. The Government could find itself in the position within 4-5 years of needing some 14,000 additional medical, paramedical, and ancillary staff, and another 13,000 within 8 years. As if resigning itself to these numbers, the MOH has followed the lead of MODA and the National Guard and decided to contract out the running of its hospitals to international health care firms. However, the practice of running medical facilities under contract programs, which costs between $300,000-$350,000 annually per bed, makes health care an extremely expensive service.

The Government has carefully balanced its expansion plans for the public health sector with a program providing support and incentives for the private sector. Private health services, with 10 percent of the country's total beds, are much smaller and their manpower problems more manageable than the unwieldy public sector. About 150 doctors work in private practice and 500 in private hospitals or clinics. Private health care is ensured continued government support and subsidies, but because of growing competition and increasingly saturated markets, particularly in Riyadh and Jeddah, expansion is expected to decline from the dynamic 1975-80 growth. With their high level of medical care, private hospitals—consisting of 50-150 beds each—will continue to satisfy an important demand.

The Saudi Government is pursuing an ambitious medical facility construction program that will continue to provide considerable business for foreign contractors. There have been delays in the construction and equipment of a number of major hospital projects, in particular the Riyadh medical complex, but contracts are expected to be awarded on a series of new hospitals this year. Among those are MOH's 12 hospital programs for general hospitals, continuation of the Riyadh medical city complex of general and specialist hospitals, and 3 hospitals in Jeddah—including a cancer center. Under study among others, are two hospitals in Taif (350-bed chest disease and 550-bed psychiatric) and a 200-bed psychiatric hospital in Baha.

The Saudi's leading domestic firm in this market is Saudi Medcenter. This year it obtained a $78 million contract to supply 1,400 laboratories in Jeddah—including a cancer center. Under study among others, are two hospitals in Taif (350 bed chest disease and 550 bed psychiatric) and a 200 bed psychiatric hospital in Baha.

The Saudi's leading domestic firm in this market is Saudi Medcenter. This year it obtained a $78 million contract to supply 1,400 laboratories for the King Saud University project in Riyadh. Medcenter, which is also the exclusive agent for major foreign medical suppliers such as Siemens, has a subcontract from Pollensky and Zoellner of Germany to supply all medical equipment for the 800 bed King Khaled teaching hospital. It holds a number of other subcontracts to supply and maintain medical equipment for other MOH hospitals. All these subcontracts provide sales opportunities for U.S. firms.

A successful German company in the Saudi construction market, Philip Holzmann, built and outfitted five new MOH hospitals, each with a 340-460 bed capacity, at Al-Khobar, Hofuf, Jeddah, Jizan, and Medina, under a $500 million turnkey contract. Among the medical equipment it supplied were X-ray devices, operating theatres, computerized blood analyzers, a kidney clinic, and video display monitoring. It also built two 100-bed hospitals at Afif and Aflaj at a cost of $175 million and one 200-bed hospital at Kharj. Gustav Epple is another major German contractor in the Saudi market.

Other foreign companies are also successful contractors. The Dutch firm, Ballast Nedam, does contract work in Saudi Arabia; the French firms Bouygues, and Dragages & Travaux Publics, in a joint venture with a Saudi Arabian firm, have constructed seven MOH hospitals; Skanska Cement of Sweden has worked on medical construction projects; and FEAL, an Italian firm, received a contract to establish a network of rural clinics. In a joint venture with NME, FEAL is also building a 300-bed hospital for MODA at Taif. Korean firms active in hospital construction include Dongsan Construction Co., Han Yang and Hyundai Engineering and Construction.

Continuing their active participation in past Saudi medical construction projects, U.S. firms have obtained several consulting contracts for major hospital construction through 1985. The most active American company, Rogers, Burgun, Shahine & Deschler, has worked on three projects: a $1.5 billion medical complex at Riyadh, a $110 million cancer hospital at Al-Khobar, and a $12 million private hospital at Jeddah. In addition, Stone, Marraccini & Patterson is advising on construction of a $250 million hospital at Al-Batin, and Gresham Lindsay Reid, Ltd. is consulting on extension of the King Faisal Specialist Hospital at Riyadh.

Marketing Practices

Purchases of medical equipment in Saudi Arabia have been channeled approximately as follows:

- 10 percent direct purchase from abroad by end-users
- 55 percent through turnkey constructors
- 35 percent through Saudi agents and distributors.

Under a new Council of Ministers' ruling, however, all contractors, Saudi and non-Saudi, must import solely through local agents, except in the case of used equipment. Ninety percent of new hospital projects are still turnkey and this will continue in the foreseeable future. In turnkey projects, the constructor is responsible for the equipment to be purchased. He can in turn subcontract the equipping to a medical equipment company, or to an equipment consultant, or he can do it himself.

For smaller projects and replacement sales, local agents are the principal channels. In Saudi Arabia there are about 35 distributor companies dealing with medical equipment. Most of them are well off already, since the major part of the imported equipment is covered by agents with exclusive rights.

In general, all sales are effected "net 30 days." Previously, the price and payment/credit terms had not been of prime importance in purchase decisions. Technology, performance ratio, training, service and manpower backup have been factors of greater weight to the Saudi end-user. These continue to be a priority but as the competition hardens and oil revenues are reduced, the relative importance of price and delivery time will grow, even though it will not be as decisive a factor as in most other countries.

Stiffening competition for the turnkey projects also will lower profit margins for contractors and make them more responsive to price arguments from equipment suppliers.

Points that are worth stressing in negotiations are speed and dependability of delivery, and quality of the product and price, in that order. The most important ways of getting inside the market are setting up a local organization and organizing good information channels. Promotion should be done personally and distribution must go through a Saudi agent.

The influence of the Saudization policy which has been officially implemented since 1977, and which gives priority to Saudi firms or local companies with at least 50 percent Saudi participation, is becoming increasingly noticeable as far as the awarding of government contracts is concerned. The result is that most of the established companies and the newcomers are beginning to establish a local company with Saudi participation. The advantages are not only priority in government contracts, but also possibilities to get low-cost financing, 5-10 years of tax holiday, and legal independence. While a U.S. firm should maintain its own staff locally, it will benefit from the very important contacts and information Saudi partners can bring.

Trade Restrictions

Saudi Arabia has adopted a liberal trade policy and tariffs, if there are any, are low. There is a 3 percent ad valorem duty on instrumentation and medical furniture. Rehabilitation equipment is admitted duty-free.

More substantial tariffs are in effect only when the domestic industry manufactures competing items. Since there is no local manufacture of medical equipment of importance, tariffs are not a problem. Certain other preferences (see above) are given to local firms.

Technical Standards

There are no specific technical standards or other requirements to which imported medical equipment must conform. The power system is 220/60 cycles 3-phase, and 110/60 cycle single phase. Electrical currents are 60 cycles.

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230
Telephone: (202) 377-2988

The Survey summarizes a 68-page research report prepared by Konsulterna of Stockholm, Sweden, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Medical Equipment—Saudi Arabia," ITA 81-09-505.

Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in Saudi Arabia and trade statistics compiled by the Department of Commerce's Bureau of the Census.

Most Salable Products

Cardiological Equipment
- Intensive care systems
- Cardiac output analyzers
- Implantable pacemakers
- ECG equipment

Pulmonary Apparatus
- Volume-controlled breathing apparatus
- Respiratory equipment
- Mobile reanimation units
- Conventional inhalation devices
- Nebulizers

Neurological Equipment
- Electroencephalographs
- Encephaloscopes

Ophthalmological Equipment
- Meridional and automated objective refractometers
- Vision testing systems
- Ophthalmoscopes, direct and indirect
- Photocoagulators

Pediatric Equipment
- Diagnostic equipment
- Intensive care incubators
- Resuscitation equipment
- Monitoring systems
- Imaging equipment

Renal equipment
- Disposable dialyzers
- Renegerating dyalisis systems

Operating room equipment
- Electrosurgical units, including electrocoagulation generators
- Blood flowmeters
- Blood pressure monitors
- Blood volume analyzers/monitors
- Complex anesthesia equipment, including anesthetic gas evacuation
- X-ray equipment for surgical purposes
- Suction equipment for use with vacuum piping systems
- Surgical lighting
- Surgical tables

General Hospital Equipment
- Modern X-ray instrumentation
- X-ray therapy equipment
- Computers for planning radiation schedules and dosages
- Ultrasonic equipment
- Ultrasonic physiotherapy equipment
- High-performance autoclaves
- Thermometry products
- Bedside monitoring systems, including computerized systems

Clinical Laboratory Equipment
- Automatic analyzers
- Semi and fully automated blood counters
- Beta and gamma counters
- Computer systems for monitoring automated instruments
- Ultraviolet spectrometers
- Gas chromatographs
- Conventional lab equipment

Miscellaneous Health Care Equipment
- Mobile testing systems
- X-ray units for chest surveys
- Mobile laboratory equipment
- Disposables
- Mammographic equipment
- All kinds of quality disposable products

Orthopedic and Prosthetic Equipment
- Implantable pacemakers

Architectural, Transportation, and Mobility Equipment
- Wheelchairs

Physical and Occupational Therapy Equipment
- Tools
- Instruments
- Work tables
- Vocational training devices

Sensory Aids and Adaptive Systems
- Hearing aids
- Braille devices

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CMS/IPC/533/83; June 1983

CMS

Country Market Survey

Industrial Process Controls

India

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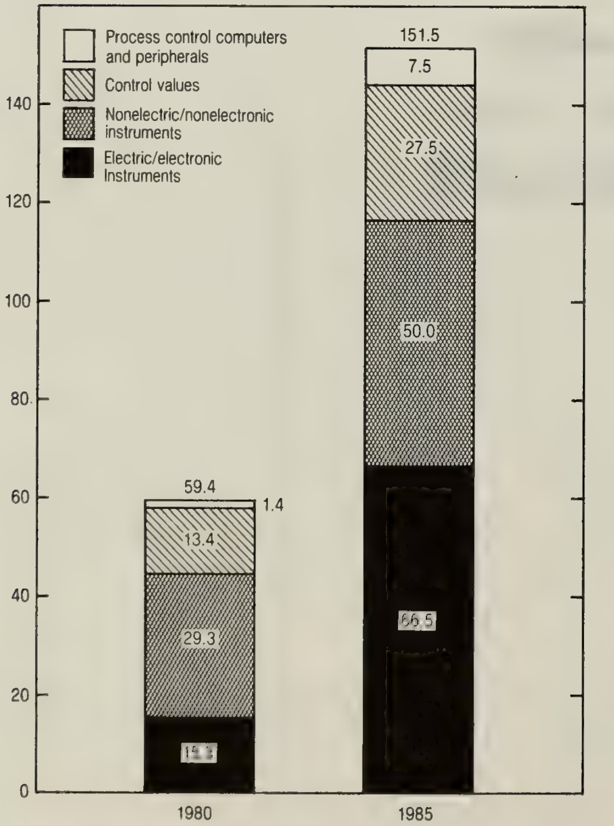
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Massive investment in the development of India's heavy process industries is expected to stimulate strong demand for industrial process controls. Instrumentation sales are projected to grow at a 21 percent annual rate, from a level of $59.4 million[1] in fiscal year 1979-80 to more than $150 million in 1984-85 (see table 1 and figure). The Government's Sixth Five Year Plan (1980-85) allots high-priority to such process industries as power generation, fertilizer production, offshore oil exploration, steel, petrochemicals, and cement. Investment in electricity generating plants should spur greatest demand. The discovery of petroleum off India's western coast also offers potential for wider use of process instruments in the future. Many of the sophisticated controls required for new plants are not built in India, and U.S. firms already capture a healthy 28 percent of imports (see table 2). Increased use of electronic instruments and process computers is expected to mean bright prospects for American vendors, whose sales are projected at some $23.5 million in 1984.

India: The market for industrial process controls, 1980 and 1985

(in millions of U.S. dollars)



Source: International Trade Administration, Office of Trade Information Services research report.

Table 1.—India: The market for industrial process controls, 1980, 1981, 1982, and 1985

(in millions of U.S. dollars)

	1980	1981	1982	1985
Electronic/electric instruments				
Production	10.3	16.5	27.0	47.0
Imports	5.2	8.0	10.0	20.0
Exports	0.2	0.2	0.3	0.5
Market size[1]	15.3	24.3	36.7	66.5
Nonelectronic/nonelectric instruments				
Production	19.6	22.0	24.5	34.0
Imports	10.0	11.0	13.5	19.5
Exports	0.3	0.5	1.0	3.5
Market size	29.3	32.5	37.0	50.0
Control valves				
Production	3.4	4.0	7.0	15.0
Imports	10.7	12.0	13.5	18.0
Exports	0.7	1.0	3.0	5.5
Market size	13.4	15.0	17.5	27.5
Process control computers and peripherals				
Production	0.4	0.5	1.0	4.0
Imports	1.0	1.0	2.0	3.5
Exports	—	—	—	—
Market size	1.4	1.5	3.0	7.5
Totals				
Production	33.7	43.0	59.5	100.0
Imports	26.9	32.0	39.0	61.0
Exports	1.2	1.7	4.3	9.5
Market size	59.4	73.3	94.2	151.5

[1] Market size equals production plus imports minus exports. Parts are excluded.
Source: International Trade Administration, Office of Trade Information Services research report. See Additional Information box.

With sales amounting to $24.3 million in fiscal 1981, **electric and electronic** instruments accounted for fully a third of the market, up from one-fourth in fiscal 1980. Indian plants are increasingly equipped with sophisticated electronic controls to cut energy use and other production costs, boosting sales of these devices at a projected 34 percent annual pace to $66.5 million in 1984.

Fastest growth is expected in the market for **process control computers and peripherals,** which is expected to quintuple (from $1.4 to $7.5 million) over the 1980-85 period. Local observers foresee wider use of microprocessor and computer control in electric power stations, fertilizer plants, steel mills, and the petroleum extraction and refining industry.

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[1] Statistics in this Survey are based on the Indian fiscal year (April-March); the year indicated (e.g., 1980) refers to the fiscal year ending in March of that year (March 1980). All values are shown in U.S. dollars. Local currency data for all years are converted at the exchange rate of US$1=Rs8.50. Values for years through 1981 are expressed in current rather than constant dollars; values for 1982 and subsequent years are expressed in 1981 constant dollars.

Despite the trend to install computers and electronic process controls, **nonelectronic/nonelectric instruments** remain popular for many applications in India, with sales approaching $30 million in fiscal 1980. Local engineers consider pneumatic controls well suited to India's tropical environment, though the growing refinement and versatility of electronic instruments is expected to mean spending on nonelectronic devices will grow at half the overall market rate. Annual expansion of 11 percent per annum is foreseen, to $50 million in 1985.

Purchases of **control valves** by Indian process plants amounted to $13.4 million in fiscal 1980, with market growth of over 15 percent a year predicted over the 1980-85 period. Valves make up a substantial share of instrumentation purchases in many sectors tapped for growth by the current development plan. According to Indian engineers, control valves account for 25 percent of the instrument budget in a typical petroleum refinery, 21 percent for a fertilizer plant, and 26 percent for a thermal power plant. Trade sources predict a 1985 market of some $27.5 million.

Table 2.—India: Imports of industrial process controls by country of origin, 1980 and 1985

(in millions of U.S. dollars)

	1980	1985
Electronic/electric instruments		
United States	1.8	9.5
Germany	1.2	4.0
United Kingdom	1.0	3.0
Other	1.2	3.5
Subtotal	5.2	20.0
Nonelectronic/nonelectric instruments		
United States	2.4	7.0
Germany	3.0	5.0
United Kingdom	2.5	4.0
Other	2.1	3.5
Subtotal	10.0	19.5
Control valves		
United States	2.8	5.0
Japan	3.0	5.5
Germany	2.4	3.5
Other	2.5	4.0
Subtotal	10.7	18.0
Process control computers and peripherals		
United States	0.6	2.0
France	0.2	0.5
Germany	0.1	0.5
Other	0.1	0.5
Subtotal	1.0	3.5
Total	26.9	61.0

Source: International Trade Administration, Office of Trade Information Services research report.

Competitive Environment

Domestic suppliers manufacture a fairly broad range of process controls commercially; nevertheless, Indian firms are unable to provide the specialized instruments that are increasingly in demand. Imports of $26.9 million supplied some 45 percent of Indian industry's instrumentation needs in fiscal year 1980. Average annual increases of nearly 18 percent are projected, with purchases from foreign sources reaching $61 million in 1985.

U.S. suppliers.—American manufacturers are recognized as technological leaders in the Indian market, and they capture a larger share of imports ($7.6 million in 1970) than any other source. The booming demand for electronic and microprocessor-based instruments promises to be a boon for U.S. vendors who specialize in high-technology products. Shipments from American factories are forecast to grow a swift 25 percent annually over the 1980-85 period; capturing nearly 40 percent of imports in the latter year. The U.S. position is enhanced by a number of joint ventures with local process control manufacturers, which provide the American partner with ready access to Indian customers.

U.S. sales of electronic/electric instruments amounted to only $1.8 million in 1980, but an impressive five-fold expansion to $9.5 million (47 percent of imports) is anticipated by 1985. Sales forecasts show excellent prospects for a number of U.S.-built electronic controls, including oxygen analyzers; redex, specific ion, and conductivity equipment; combustible and thermal conductivity analyzers; pH measuring equipment; and electronic receivers, controllers, and control accessories. Among the prominent American vendors enjoying the benefits of local subsidiaries or ties with local companies are Rosemount, Foxboro, Taylor Instrument, and Houston Instrument Division of Bausch & Lomb.

Purchases of American-built nonelectronic/nonelectric instruments are also expected to pick up sharply. From $2.4 million in 1980, sales are projected to grow to $7 million in 1985, representing 24 percent per annum expansion. Strong demand exists for nonelectronic sensing/measuring instruments for flow, liquid level, and pressure; explosion-proof pressure switches and solenoid valves; self-actuated pressure regulators; and ultrasonic flow and level indicators. Leading U.S. suppliers in this category are broad line process control manufacturers active in the market.

Slower, but nevertheless respectable, growth is anticipated for imports of U.S.-made control valves. Average annual increases of 12 percent are forecast, bringing sales to $5 million in 1985, up from $2.8 million in 1980. Specialized high-temperature and -pressure valves and electronic safety valves offer the best opportunities for U.S. sales. One leading American competitor, ITT Grinnell, has issued a license for local manufacture of its valves by Kerala State Electronics Development Corporation (KELTRON).

Process control computers and peripherals are in demand for many of the major plants now being constructed, and U.S. suppliers can expect to account for well over half of India's imports for the next few years. American computer sales are projected at $2 million in 1985, up from $600,000 in 1980.

Third-country suppliers.—Third-country competition to U.S. dominance of the market comes from firms in the United Kingdom, Germany, and Japan, and to a lesser degree from French, Swiss, and Australian manufacturers. As is the case with U.S. companies, the successful foreign vendors are often those with domestic subsidiaries or licensees.

German manufacturers ranked second to U.S. firms in 1980, capturing 25 percent of imports with equipment worth $6.7 million. By 1985, industry sources predict shipments from Germany worth $13 million. German suppliers are especially strong in the market for nonelectronic controls, outselling all other vendors of such instruments in 1980. Germany's Siemens has long operated a local affiliate, Siemens India Ltd. (SIL), for sales and, increasingly, manufacture. SIL's Contracts Division designs and builds complete electrical systems for large power plants, thus helping boost sales of German-sourced Siemens equipment. Other prominent suppliers include Hartmann & Braun (which has a local licensee) and Frisk & Hanover.

Competitors from the United Kingdom have longstanding ties with Indian businessmen. In 1980 British firms sold electronic instruments worth $1 million and nonelectronic instruments valued at $2.5 million, accounting for 23 percent of combined imports of those two categories. The Swiss-owned British company BBC-Kent has a licensing deal with one of India's biggest process control manufacturers. Several other firms (Babcock Bristol, Ferranti) specialize in data acquisition systems and remote telemetry units. U.K. sales in 1985 are projected to top $7 million.

Japanese manufacturers are said to benefit from the practice of tying aid funds to procurement from the financing country. Fertilizer plants built with Japanese aid, for example, used a Japanese contractor, who in turn selected Japanese-built process controls. By offering discounts of as much as 40 percent, Motoyama has forged a particularly strong position in the market for valves. Purchases from Japan accounted for nearly 30 percent of control valve imports in 1980, and that share is unlikely to diminish over the 1980-85 period. Japan's Yamatake-Honeywell enhances its market presence through licensing and technical agreements with one of India's two largest instrumentation manufacturers.

Vendors from other countries generally compete with only a limited product range. France provides 20 percent of imported process control computers and peripherals, but has had little success in other market segments. Bailey Controls', French subsidiary, Controle Bailey, has licensed a local company to build its valves. Philips (Netherlands) also sells some process controls through its Indian manufacturing affiliate.

Domestic suppliers.—Indian output of industrial process controls approached $34 million in fiscal 1980, with 24 percent annual expansion to $100 million predicted for 1985. The domestic industry comprises two large manufacturers, about a dozen medium-sized firms (many of which have licensing arrangements with overseas companies), and as many as 140 small-scale firms with turnovers of less than $1 million.

Instrumentation Limited (IL), a leading publicly owned manufacturer of process controls, reported sales of about $26 million from its two factories in 1981. Established in 1964 with financial and technical assistance from the Soviet Union, the company has since signed licensing agreements with such foreign manufacturers as BBC-Kent, Yamatake-Honeywell, and Hartmann & Braun. Output covers a broad range of instrumentation, including indicators, recorders and controllers, control valves, gas analyzers, temperature transmitters, magnetic electric instruments, control panels, annunciators, manometers, hydraulic instruments, and pneumatic controls. Since IL is wholly Government-owned, it wins numerous turnkey contracts to supply instrumentation for large public sector projects. The firm is an established supplier to thermal power plants, steel mills, petroleum refineries, and the pulp and paper industry.

Taylor Instrument (India) was also set up in 1964, under license from Taylor Instrument of the United States. Taylor's locally built instrumentation has earned a reputation for meeting international standards. Most of the instruments manufactured are pneumatic: controllers, recorders, indicators, miniature control valves, valve positioners and accessories, and strain gage transmitters for measurement and control of pressure, temperature, and flow level.

Several medium-sized firms also rely on U.S. technology. Bell Controls, only a distributor of foreign-built instrumentation in the past, has begun manufacturing and hopes to increase the proportion of locally built equipment in its product line. Its recent tie-up with Foxboro is expected to mean sharply stepped up sales for Bell over the next 5 years. The firm's output will eventually comprise sensing and measuring instruments for temperature and pressure, control valves, pyrometers, thermocouples, gages, oxygen analyzers, and miniature pneumatic controllers and differential pressure transmitters. In addition, Rosemount plans to begin local manufacture of electronic pressure/temperature transmitters, indicators, and analytical instruments. Switzer Instrument of Madras builds industrial pressure switches, draft gages, and receiver indicators under license to the Hays-Republic Division of Milton Roy. And an agreement between Houston Instrument and Digital Electronics of Bombay covers a wide range of recording instruments.

KELTRON, the prominent Indian manufacturer of control valves, collaborates with Controle Bailey (France), and may soon begin producing valves designed by ITT Grinnell Valve (U.S.). Toshniwal Industries employs technical agreements with Gebruder Moller (Switzerland) and Sperry (U.S.) to produce electronic controllers, single multipoint electronic recorders, resistance temperature detectors (RTD's) thermocouples, indicators, optical pyrometers, and industrial on-line pH systems. Siemens India (affiliate of Siemens, Germany) has aggressively expanded production of previously imported process controls, particularly the types used by cement plants and by the power industry. The company has plans to begin manufacturing electronic converters for temperature, speed, current, reactive power, flow, and level measurements. PIECO Electronics, the Indian affiliate of Holland's Philips, produces pH measuring and controlling instruments locally and is expected to broaden its domestic manufacture in the near future.

Electronics Corporation of India Ltd. (ECIL) produces some process controls as part of a broad product line that also includes television sets and calculators. The firm is not a major instrumentation manufacturer, but its Power Reactor Instrumentation Division is a large purchaser of instruments for control systems designed and installed for end-users on an OEM (original equipment manufacturer) basis. Other active local competitors include Mahindra & Mahindra (rotameters, differential pressure flowmeters, bellows gages, pneumatic transmitters, thermocouples); J.N. Marshall (potentiometric controllers, pH and conductivity analyzers, pressure and temperature indicators/recorders/controllers, magnetic flowmeters); and H. Guru Instruments (pressure gages, power converters, signal converters, flowmeters, thermocouples).

Most of the small-scale domestic firms have sales of less than $100,000 a year. However, some have turnovers as high as $400,000 to $700,000; these include Lectrotek Laxson Engineering, Southern Instruments and Electronics, Cambridge Instruments, and Udeyraj and Sood.

Major Industrial Users

The importance of the process industries to India's continued economic development is explicitly recognized by the Sixth Five-Year Plan. Spanning the 1980-85 period, the Plan allocates $35 billion to developing the power, fertilizer, petrochemical, steel, paper, cement, and oil production industries (see table 3). Expansion of electricity generating capacity to overcome crippling power shortages receives the largest share of resources, accounting for $22.7 billion. The fertilizer, steel, and offshore oil exploration sectors together account for nearly $10 billion in Plan expenditures.

Based on the Sixth Plan and on calculations by Indian engineers, purchases of industrial process controls are expected to total $524 million over the 1980-85 period. Power stations are forecast to account for the largest share of purchases: nearly 50 percent ($259 million). Fertilizer plants anticipate investment of $97 million in instrumentation, while steel mills expect to install process controls worth some $60 million. Offshore oil rigs are projected to need $47 million worth of process instrumentation.

Sectors offering the best markets for process controls in India are profiled below.

Table 3.—India: Demand for industrial process controls by major process industries under the Sixth Five-Year Plan (1980-1985)

(in millions of U.S. dollars)

Sector	Total plan outlay	Total instrument spending
Power generation	22,665	259
Fertilizer	2,785	97
Petrochemicals	1,132	40
Steel	4,251	60
Paper	400	11
Cement	495	10
Offshore oil exploration and production	3,381	47

Source: Estimates based on Sixth Plan (1980-85) documents, Planning Commission, Government of India, and Central Electricity Authority (for power generation sector estimates).

Electric power generation, transmission, and distribution.—Total installed electricity generating capacity in India amounted to about 31,000 megawatts (MW) in 1980, and is projected to top 51,000 MW by the end of the Sixth Plan. Public utilities, which generate and distribute over 90 percent of the country's electricity, expect to add nearly 4,800 MW of hydropower generating capacity, 14,700 MW of thermal plant generating capacity, and 690 MW of nuclear capacity. As many as 75 new thermal plants are to be constructed. The National Thermal Power Corporation (NTPC) is building five thermal superstations with installed capacities of 1,000-2,000 MW each at locations across the country. Tata Electric, the only significant private-sector firm, is expanding its thermal plant at Bombay with a 500 MW unit.

Strongest instrumentation demand is anticipated for data loggers and monitoring systems, sales of which are forecast at more than $110 million over the Plan period. Other process controls in demand by this expanding industrial sector include solenoid trip valves, flame detection scanners, oxygen analyzers, temperature sensing and measuring instruments (including digital temperature indicators and infrared thermometers), control valves, rotameters and purge meters, flowmeters, level and pressure gages, data loggers, and computerized load monitoring equipment.

Purchasing decisions for the electricity sector are heavily influenced by several organizations. The Power Projects Engineering Division (PPED) of Bhaba Atomic Research Center in the Department of Atomic Energy designs and equips nuclear power plants in 200 MW stages. Instrumentation is designed by ECIL, the prominent OEM buyer of process controls destined for electric power plants. Private-sector consultants making purchase decisions for the power industry include Development Consultants and Tata Consulting Engineers. Bharat Heavy Electricals (BHEL), a large public-sector corporation and a leading supplier of electricity generating equipment, also influences the selection of process instrumentation in power plants.

Fertilizer manufacturing.—Starting with an installed production capacity of 85,000 metric tons (MT) in 1956, India's nitrogenous fertilizer industry grew to comprise 22 large plants with a capacity of almost 4 million MT by 1980. Production capacity for phosphatic fertilizers grew from 64,000 MT to 1.3 million MT (from 10 plants) over the same period. Demand for fertilizer continues to climb. By 1985 Indian farmers are expected to need 6 million MT of nitrogenous and 2.3 million MT of phosphate fertilizers, well above the projected outputs of 4.2 and 1.4 million MT, respectively.

To expand domestic production capacity, the Indian Government is investing heavily in natural-gas-based fertilizer plants over the next 5 years, exploiting the discovery of natural gas along the country's west coast. A total of $2.8 billion is to be spent on expanding fertilizer output over the 5-year Plan period. Investment in process controls is projected at $97 million. Salable items include RTD's, radiation pyrometers, bourdon tube gages, bellows gages, oxidation-reduction potential meters, differential pressure flowmeters, floats, reflex level gages, controllers, process control computers, digital recorders and indicators, annunciators, control valves, actuators, beta/gamma/X-ray absorption meters, positive displacement meters, and continuous and scan monitors.

Steel mills.—India's steel industry comprises five state-owned integrated mills and one private factory. Two smaller public plants manufacture alloy and special steels. Steel production amounted to 7.4 million MT in 1980, and Government plans call for a dramatic rise in output, to 11.5 million MT by 1985 and to 17.4 million MT by the end of the decade. By 1985, a 4 million MT expansion project at the Bhilai Steel Plant is to be ready, and the first stage (4 million MT) of the Bokaro Steel Plant expansion should be finished. Phase I (1.15 million MT) of the Vizag Steel Plant is also likely to be nearing completion.

The Sixth Plan includes more than $4.2 billion to be invested in new steel mills. In addition, Tata Iron and Steel, the lone private-sector steel company, plans to spend some $235 million on new plant and equipment over the 1980-85 period. Process control instruments likely to be needed to equip steel mills include radiation pyrometers, thermistors, strain gages, ionization/vacuum gages, McLeod gages, ultrasonic and electromagnetic flowmeters, ultrasonic gages, nuclear radiation gages, pyrometers, microwave absorption devices, gas chromatographs, on-off controllers, proportional controllers, process control computers, and data loggers.

Oil and gas extraction.—To develop urgently needed domestic oil and gas resources, the Indian Government has launched numerous offshore oil exploration and drilling programs since 1974. The Oil and Natural Gas Commission (ONGC) and Oil India Limited (OIL) have drawn up ambitious expansion plans. ONGC intends to spend $2.5 billion on offshore oil exploration over the course of the Five Year Plan. Government's total investment in offshore oil exploration and production over the period is set at nearly $3.4 million. Annual output from India's Bombay High oil field is expected to rise to 9 million MT in 1982, 12 million MT in

1983, and 15 million MT by the end of 1985. The World Bank is financing about half the $860 million cost of development of the southern and central areas of the field, which includes drilling 64 wells and constructing 15 production platforms, a processing platform, and a platform for living quarters.

Total spending on instrumentation over the Plan period is projected at $47 million. Process controls expected to be in demand include thermal sensing bulbs, diaphragm capsule gages, radiation pyrometers, positive displacement pressure gages, liquid chromatographs, turbidity meters, on-off and proportional controllers, process control computers, digital recording and indicating systems, data loggers, pilot-actuated regulators, and telemetry systems for data controlled butterfly valves.

Other sectors.—Among the other industries forecast to step up their purchases of industrial process controls are petroleum refineries, petrochemical plants, and cement factories. Expansion of refining capacity by some 5.8 million MT and provision of secondary processing facilities are foreseen requiring instrumentation purchases of $12 million over the course of the Five-Year Plan. The largest shares of instrumentation budgets are expected to go to control valves (25 percent), controllers (24 percent), and measuring instruments (22 percent).

Investment in petrochemical capacity is expected to top $1.1 billion over the same period, including some $40 million for process controls. Projects initiated in the public sector include an olefins complex using natural gas as feedstock, aromatic recovery facilities for benzene and xylene, and a caprolactam plant. Measuring instruments and controllers are expected to make up over half the sector's process control purchases.

Industry observers expect cement production, which stood at 24.3 million MT in 1981, to increase to 43 million MT by 1985. At least 8 plants with 1 million MT capacity, as well as several smaller plants, are expected to come on-stream during the 1980-1985 period. Planned investment of $495 million includes about $10 million in process controls.

Market Access Data

Domestic consulting engineering firms are playing an increasingly important role in setting up new process plants in India, and often determine the choice of process instrumentation. Through collaboration with reputable international firms, Indian engineers have developed capabilities for designing and equipping large textile mills, power plants, integrated steel mills, fertilizer plants, and chemical and petroleum complexes. Reputable consultants offer a good contact point for U.S. firms wanting to sell process controls in this expanding market. In addition, opportunities exist for U.S. consulting engineers in such specialized fields as petrochemicals, specialty chemicals, and fertilizers. Despite an official Government guideline that only Indian firms should serve as prime contractors, some public sector corporations call directly on foreign engineering expertise.

Chronic foreign exchange constraints force the Indian Government to regulate imports tightly and to give preference to domestically manufactured instrumentation. Import licenses are required, and imported process controls carry a duty of 40 percent ad valorem, regardless of origin. Nevertheless, interest in foreign-built products is high, and imports of process controls receive priority under certain conditions. These include projects funded by the World Bank, which require procurement through global tenders; projects involving complex, high-technology systems and firm completion deadlines; urgent requirements for replacement parts; and imports of specialized instruments whose manufacture cannot be justified locally.

India's strictures on imports require different marketing methods than those commonly used by U.S. manufacturers in other countries. An aggressive, reliable Indian agent who knows the market and is familiar with the Indian Government's import regulations and procedures is considered essential to market success. Trade sources also recommend periodic visits from technically oriented senior sales executives, as well as product exposure through participation in industry-sponsored exhibitions and U.S. Department of Commerce catalog shows in India.

Additional Information

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The Survey summarizes a 68-page International Market Research (IMR) report prepared by the U.S. Foreign Commercial Service in New Delhi and Bombay, and reflects the opinions and views of interviewees in India. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
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When placing an order for this research, please request "The Market for Industrial Process Controls in India," ITA 82-01-501, October 1981.

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Country Market Survey

MINING INDUSTRY EQUIPMENT

India

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International Trade Administration

The market for mining industry equipment in India is expected to rise from $498 million [1] in 1980 to an estimated $835 million in 1985, an average annual growth rate of almost 11 percent (see table 1). Major expansions are planned in the mining industry, with heavy emphasis on coal mining, and in such downstream industries as steel, cement, and fertilizer production.

The Indian market for mining excavating and earthmoving equipment,[2] which accounts for about 60 percent of the total market, is forecast to jump from $305 million in 1980 to $500 million in 1985. Sales of mineral material handling, lifting and hoisting equipment [2] are predicted to nearly double, reaching $213 million in 1985. Demand for mineral preparation and processing equipment is expected to increase at a more moderate rate, with sales of $70 million in 1980 and anticipated sales of $102 million in 1985 showing close to an 8 percent annual growth rate. The exploration, prospecting, and miscellaneous segment, on the other hand, is burgeoning at better than 20 percent annually, with sales expected to grow from $3 million in 1980 to $20 million in 1985.

Competitive Assessment

India's strong domestic manufacturing base enabled local producers to account for approximately 80 percent of the total mining industry equipment market in 1980. Despite anticipated healthy growth

Table 1.—India: The market for mining industry equipment

(in millions of U.S. dollars)

	1977	1978	1979	1980	1983 (Est.)	1985 (Proj.)
Mining, excavating, earthmoving and hauling machinery and equipment						
Production	130.0	160.5	200.0	240	282.5	350
Imports	51.0	62.0	65.0	70	125.5	160
Exports	3.0	2.0	4.0	5	7.0	10
Market size	178.0	220.5	261.0	305	401.0	500
Mineral/materials handling, lifting and hoisting equipment [1]						
Production	108.5	108.0	102.0	100	164.5	185
Imports	16.5	16.0	20.0	23	32.5	38
Exports	3.0	4.0	4.0	3	5.0	10
Market size	122.0	120.0	118.0	120	192.0	213
Mineral preparation, processing and selected utility equipment						
Production	51.5	55.5	60.5	62	83.5	95
Imports	12.0	8.5	10.0	10	10.5	15
Exports	3.5	3.5	2.5	2	4.0	8
Market size	60.0	60.5	68.0	70	90.0	102
Mining exploration, prospecting, and electronic communication equipment [1]						
Production	—	—	—	3	5.0	10
Imports	—	—	—	—	5.0	10
Exports	—	—	—	—	—	—
Market size	—	—	—	3	10.0	20
Total, all categories combined						
Production	290.0	324.0	362.5	405	535.5	640
Imports	79.5	86.5	95.0	103	173.5	223
Exports	9.5	9.5	10.5	10	16.0	28
Market size	360.0	401.0	447.0	498	693.0	835

Source: International Trade Administration, Office of Trade Information Services, research study, The Market for Mining Industry—India (see Additional Information box).

[1] The data provided in this product category encompasses equipment with mining and construction applications.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=9.00 Rs. (1977), 9.11 Rs. (1981 and subsequent years). Values for years through 1981 are given in current dollars; values for 1982 and subsequent years are given in 1981 constant dollars.

[2] The data provided herein for this product category encompasses equipment with mining and constructing applications.

Table 2.—India: Imports of mining industry equipment by country of origin [1]

(in percentages)

	1978	1981	1983 (Est.)	1985 (Proj.)
Mining, excavating, earthmoving, and hauling machinery and equipment				
United States	26	26	25	27
U.S.S.R.	16	18	20	23
Japan	18	16	15	12
United Kingdom	20	23	20	18
West Germany	14	15	15	12
Other	6	2	5	8
Total	100	100	100	100
Mineral/materials handling, lifting, and hoisting equipment				
United States	22	25	26	25
United Kingdom	23	24	22	23
West Germany	21	22	20	22
U.S.S.R.	19	17	16	15
Japan	2	1	2	2
Other	13	11	14	13
Total	100	100	100	100
Mineral exploration, preparation, processing and general utility [2] equipment and accessories				
United States	20	22	22	22
West Germany	36	38	35	30
United Kingdom	18	20	16	20
U.S.S.R.	12	14	14	15
Japan	4	2	3	5
Other	10	4	10	8
Total	100	100	100	100
Total market share for all categories				
United States	25	26	28	28
U.S.S.R.	20	20	20	22
West Germany	18	18	16	17
United Kingdom	18	20	20	18
Japan	14	12	8	8
Other	5	4	8	7
Total	100	100	100	100

[1] Source: See source notation and footnote on table 1.

[2] Includes electronic controls and communication equipment.

in the market through 1985, however, domestic concerns' share of total sales is projected to slip to about 75 percent in 1985. Indian imports in 1985 are expected to be more than double the 1980 level, reaching some $223 million.

U.S. suppliers account for about 25 percent of the import market, with leading shares in the mining, excavating, and earth-moving and mineral/materials conveying and transportation equipment segments, and second place in the supply of mineral preparation and processing (see table 2). The technical superiority and high productivity of U.S.-made products are known and preferred among Indian importers. However, competition from third-country suppliers is growing, with Soviet concerns steadily increasing their share of the excavating and earthmoving equipment market, and U.K. and West German firms taking 20 and 18 percent of the import market, respectively, in 1981.

Domestic suppliers.—Indian manufacturers of mining industry equipment have installed capacities estimated at $850 million for the production of earthmoving and excavating equipment, underground mining machinery, lifting, loading, and mechanical handling equipment, and mineral processing equipment. Nevertheless joint ventures and licensing arrangements with foreign interests are encouraged in order to acquire selected modern equipment.

Domestic manufacturers of mining equipment offer a wide range of products. These include coal cutters, medium and heavy duty chain conveyors, friction and hydraulic props, shearers, mine pumps, booster fins, advancing power-roof supports, and vertical transport systems. Local production of coal washery equipment is well established.

Manufacturers of earthmoving and excavating equipment include eight major concerns (three public, five private) that are targeted to increase unit (individual pieces of equipment) production within the Sixth Five-Year Plan (1980-85) by 70 percent to a total of 2,430 units of equipment in 1985. Among the types of equipment produced are ¾-cubic-yard to 7-cubic-yard excavators/shovels, 15-50-metric-ton dumpers, 275-hp tractors/dozers, 3-cubic-yard loaders.

In the public sector Bihar-based Heavy Engineering Corporation, has concluded licensing agreements with U.K. and U.S. firms for the production of large draglines and mining shovels. Bharat Earthmovers Ltd. has an arrangement with Westinghouse Air Brake (United States) for the local production of 85-120-metric-ton dumpers and with Komatsu (Japan) for 400-hp dozers; the firm is also seeking further arrangements with U.S. interests for the production of 7-cubic-yard front-end loaders, hydraulic excavators, electric shovels, and underground mining equipment. Mining and Allied Machinery Corporation is seeking technical cooperation from abroad to produce powered roof supports, shearers and heavy-duty conveyors, roadheaders and dinters, and related heavy duty equipment.

In the private sector, Larsen & Toubro has a licensing agreement with Poclaine (France) to produce hydraulic excavators up to 4.2 cubic meters in size at its plant at Bangalore. This firm has also shown interest in developing high-pressure hydraulic systems and components. Mines Safety Appliances is seeking to produce methanometers and self-rescuers, and RMT Drill Private Ltd. in Tamil Nadu has developed manufacturing facilities for load-haul dumpers in cooperation with OY Tampella AB (Finland). Hindustan Motors makes earthmoving equipment at Trivellore, including 85-100-metric-ton dumpers, and plans to produce 8-cubic-yard front-end loaders.

U.S. suppliers.—Opportunities for sales of U.S. mining industry equipment in India remain generally favorable. Above-average demand is expected through 1984 for various types of excavating and earthmoving equipment: hydraulic backhoes and power shovels, dragline and shovel buckets, continuous miners, dredging machinery, rock and percussion drills, and a large range of excavators.

In the conveying and transportation category, excellent sales potential exists for trolley/tow, pneumatic tube, portable, underground, and gravity conveyors; and off-highway rear-dump trucks and truck-tractor haulers. Substantial demand is expected for various types of exploration and prospecting equipment especially sophisticated geophysical and electronic instruments, like magnetometers, electromagnetometers, syntolameters and Geiger counters. Computerized temperature control systems are also likely to enjoy considerable demand. Stable demand is expected for many kinds of mineral processing equipment: crushers flotation units separators, cyclones, scrubbers, dryers, spirals, thickeners, filters, feeders, and washing and screening plants. General utility equipment required will include portable, stationary, and heavy compressors.

Although U.S. supplers retain the largest individual share of the Indian import market for mining industry equipment, their portion has been declining since the 1960's and competition from third-country suppliers is constantly growing. Market researchers advise that U.S. firms develop long-term strategy for the Indian market and improve their aftersales service and spares supplies.

Third-country suppliers.—The successes achieved by third-country firms, which account for about 75 percent of the import market, are attributed to their willingness to overcome bureaucratic obstacles in the tightly controlled market and to the favorable loans and credit arrangements offered by their Governments to support market penetration. Moreover, the suppliers themselves pursue the market aggressively and are prepared to enter into joint venture projects with interested Indian organizations.

The Soviet Union is beginning to occupy a leading position among third-country suppliers active in the Indian market. In October 1980 an agreement was signed between the Soviet and Indian coal departments for developing new surface mines, sinking vertical and inclined shafts in the Raniganj coal areas, introducing longwall mining techniques at the Chinakuri mines, and modernizing of the Kathara and Patherdih washeries (all in Bihar). Technical assistance was also extended to develop a coking coal project in the Jharia coalfield. These and other cooperative projects secured for Soviet interests some 20 percent of the entire 1981 market, and the proportion is expected to grow. The Soviet Union's Tsvetmetpromeksport organization has offered consultancy and personnel training services to the Indian Central Mines Planning and Design Institute as well.

British Mining Consultants and British Coal International have been hired for a 2-year personnel training and consultancy program as part of an 11-million-pound-sterling aid package from the U.K. Government to help India develop its longwall mining. Another British grant of 7.6 million pounds sterling has been offered for the purchase of British longwalling equipment for four coal pits in Bihar, Madhya Pradesh, and West Bengal. British manufacturers, including Dowty, Gullic, Dobson, and Dosco, stand to benefit from the U.K.-financed development of longwall Indian mining.

German firms have served as the principal suppliers of hydraulic excavators but participate in all segments of the Indian mining industry equipment market. The German Government has offered credit facilities for supplies of mining equipment, primarily for the Neyveli Lignite Corporation in Tamil Nadu.

The Polish Kopex has been providing technical assistance to Bharat Coking Coal Ltd., a subsidiary of the State-owned Coal of India Limited (CIL), for the mechanization and reconstruction of mines in the Jharia coal belt. Polish organizations also have offered technology and equipment for the large underground Pootkee-Balihari project, which is expected eventually to produce an annual 3 milion metric tons of coking coal from investments of $155 million. An agreement has been signed with the Kopex agency for the supply of a pair of shafts, and major longwalling equipment has been provided by Polish manufacturers.

Japanese firms supply most of the bulldozers used in the Indian mining industry and are striving to improve their market penetration. French firms have been hired to provide technical aid in developing the Nandira, Gidi, Amlabad, and Talcher coal mines. France has also agreed to make loans available for the development of a massive aluminum complex in Orissa.

The Mining Industry

India has vast reserves of coal and substantial reserves of iron ore, limestone, dolomite, bauxite, copper, lead, and zinc underpinning a mining industry with $2.5 billion worth of output in 1980, up 14 percent from the previous year. Programs included in India's Sixth Plan envisage investments of about $5 billion for development of the mining industry. The Plan's emphasis on coal mining, a fifty percent increase in tonnage, will attempt to offset sharp increases in the cost of imported petroleum and to meet increasing domestic demand for coal, particularly from the thermal power engineering sector.

Three public sector organizations handle coal mining development: Coral India Ltd.; (CIL), with headquarters in Calcutta; Singareni Colleries Company Ltd., located in Andhra Pradesh; and the Neyveli Lignite Corporation with principal offices in Tamil Nadu. In the private sector, the Tata Iron and Steel Company in Bibar continues expansion of its captive mines. CIL operates directly under the Indian Department of Coal and is responsible for setting production targets, formulating guidelines for implementing policy, importing plant and equipment, and dealing with coal distribution and marketing. Its operating activities include work at 27 longwall faces, only 2 of which are mechanized. Construction of about 150 longwall faces should be completed by 1984-85. Programs have also been drawn up for the rapid mechanization of traditional board-and-pillar methods for extraction, drivages, and depillaring.

The nation's coal development program encompasses extensive geological prospecting and drilling to locate an additional 27 billion metric tons of coal reserves. Foreign technical assistance is sought to help achieve this goal. Additionally, India is seeking foreign technology associated with mine designing and planning, as well as coal beneficiation and preparation systems.

Ferrous and nonferrous metals are developed by five public sector concerns: National Aluminum Co., Orissa; Bharat Aluminum Co., New Delhi; National Mineral Development Corporation (NMDC)—includes iron mines, Hyderabad; Hindustan Zinc Limited—operates lead-zinc mines, Rajasthan; and Hindustan Copper Ltd., Calcutta. In addition, several private sector iron ore mines are being exploited in Bihar and Goa, and the Indian Aluminum Co. Limited (a subsidiary of the Canadian firm Alcan) operates bauxite mines. Major bauxite discoveries in the seventies have spurred exploitation of new reserves.

A decline in iron ore exports resulting from the recession in the Japanese steel industry, formerly a major importer of Indian ore, has tended to slow the development of new iron ore mines. However, increased domestic demand for ore for steel mills and export diversification to South Korea and Romania has prompted NMDC to plan two new iron ore mines at Bailadila in Madhya Pradesh. The mines, scheduled for development at a cost of $300 million, will produce 8 million metric tons annually and expand hematite exploitation.

NMDC also expects official approval for the construton of a new ore-pelletizing plant at Bailadila, which would utilize huge stocks of iron ore finds amounting to 12 million metric tons. With a planed capacity of 2 million metric tons, the plant is expected to contribute output for export to Indonesia or Romania. Another pelletizing plant is already under construction at Mangalore.

The Sixth Plan proposes major investments in the steel industry which will affect the nations iron ore mining capacity. Steel output is projected to rise from 9.6 milion metric tons in 1980-81 to 15 million tons in 1984-85. Some 40 billion rupees have been earmarked by the Indian Government to broaden the capacities of steel mills at Bokaro and Bhilai and to construct a new mill at Salem for the production of stainless steel. Expansion is also scheduled for mills in West Bengal and Orissa.

Other national economic development objectives outlined within the Sixth Plan are likely to affect the mining industry include increasing cement production from 18 milion metric tons in 1980-81 to 34.5 million metric tons in 1984-85, with small (50-100 metric tons daily) manufacturing facilities in remote areas a possibility, and building up the fertilizer industry to meet 1987-88 production targets of 7 million tons of nitrogen fertilizers and 2.5 milion tons of phosphorus fertilizers (P_2O_5). Even if these plans are realized, India will still be unable to fully meet domestic demand, making substantial imports of cement and fertilizers necessary.

Commodity Analysis

Coal.—India has estimated coal reserves of 112 billion metric tons with significant deposits in Bihar, West Bengal, and Madhya Pradesh. About 75 percent classifies as noncoking coal and 22 percent is suitable for coking; lignite reserves are relatively small. Coal is exploited in both underground and opencast mines, with the proportion from the latter growing and expected to account for 45 percent of output by 1985. Some 340 mines are now being worked, with total annual production averaging 114 million metric tons in 1980-81.

State investments in coal during the Sixth Plan are expected to reach $3.2 billion in an effort to boost annual output to 165 million metric tons in 1985 to meet growing demand. Forecasts indicate that in 1985 almost 100 million metric tons will be required by the thermal power and steel industries alone, with railroads, cement and fertilizer producers, and brickfields taking most of the remainder.

Iron ore.—Reserves of 30 billion metric tons (including hematite) of iron ore are being exploited at more than 400 open pit mines, which together produced about 41 million metric tons in 1980. Most deposits are located in the Bihar-Orissa Belt, the Madhya Pradesh Belt, the Karnataka Belt, and the Goa area.

Copper.—About 90 percent of India's copper reserves are found in Bihar, Rajasthan, and Madhya Pradesh. Estimated reserves of 474 million metric tons are being inadequately worked, with annual production meeting only about 42 percent of domestic demand of 55,000 tons. Even if the planned expansion to 50,000 metric tons annually is reached by 1985, output will still far short of the anticipated domestic demand of 115,000 metric tons in 1985. India is therefore expected to maintain its imports of copper at 40,000-60,000 metric tons annually.

Bauxite.—Bauxite production of 1.5 million metric tons annually comes mainly from deposits in Bihar, Madhya Pradesh, Maharashtra, and Gujarat. Massive deposits have been discovered in Andhra Pradesh and Orissa, with estimates running as high as 2 billion metric tons. Approximately 700 million metric tons have been proved. These deposits—rich in gibbsite, low in silica, and ideal for metallurgical use—are expected to drastically change the outlook for India's alumina industry.

Phosphates.—Principal production of ore currently dependent upon the 700,000 metric tons reserves located in Pajasthan. Another deposit of an estimated 65 million tons of phosphate rock exists in the Jhamarkotra area. About 45 millions tons of this discovery have been proven.

Rare earth minerals.—India has extensive heavy mineral sands on the coasts of Kerala, Tamil Nadu, and Orissa. Products obtained from sand-separation operations include ilmenite, monasite, rutile, zircon, and sillimanite.

Market Access

Marketing practices.—As the mining sector is largely controlled or financed by the Indian Government, the majority of purchasers and local end users are in the public sector. Significant mining equipment acquisitions are made through Coal India Ltd., Singareni Collieries Ltd., National Aluminum Com- contacts with these organizations and with the top decisionmakers in the appropriate government departments, as their concurrence and/or approval will be required to facilitate Indian imports of U.S. equipment. The complexity of the Indian market and of local tendering procedures for imports make it advisable for potential U.S. suppliers to employ the services of a competent local agent.

Trade restrictions.—The Indian Government's policy of protecting domestic manufacturers and controlling foreign exchange dealings is implemented through provisions contained in the annual (April or May) publication entitled "Import Trade Control pany Ltd., Hindustan Copper Ltd., and Hindusthan Zinc Ltd. Interested U.S. exporters should establish Policy." The 1981-82 policy specifies 14 "priority" industries and projects, including mineral exploration, mining, and beneficiation equipment, for which imports are allowed regardless of local availability. Bids for this equipment are evaluated by a committee of representatives from the Indian Finance, Commerce, and Heavy Industry Ministries.

Current tariff rates include a 48-percent levy on imported mining equipment and a 120-percent duty on parts and components for automatic applications. Duties for other parts and components range between 40 and 80 percent. The U.S. Department of Commerce country specialist for India can provide more details on tariff data.

Standards.—Complex and rigid standards have been established for underground mining equipment. In particular, the hazards from gas in Indian mines make electrical standards prescribed by the Director General of Mines Safety compulsory on all equipment used. Details are contained in Safety Standard Specifications IS 2118, available from the Directorate General of Mines Safety at the Ministry of Labor in Dhanbad, Bihar.

Additional Information

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The Survey summarizes a 101-page research report prepared by Sanjit Gupta, Sr. Commercial Specialist, American Consulate General, Calcutta, India, for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

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When placing an order for this research, please request "Market Research Report on Mining, Construction, and Earthmoving Equipment—India," ITA 82-03-513, November 1981.

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Electronic Components

Singapore

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Recession among its trading partners is depressing Singapore's electronic components market, which is expected to decline from $885 million in 1981 to $870 million[1] in 1985 (see table 1). The major decrease is predicted in sales of semiconductors as the electronics industry tries to insulate itself from international fluctuations by moving from integrated circuits (IC) into components such as hybrid circuits and memory devices.

Sales of passive components are forecast to rise an average 12 percent annually as the consumer electronics sector, the mainstay of the industry, shifts its production from low-value, labor-intensive goods to higher quality items. The market for electron tubes is projected to climb more than 19 percent annually because of lucrative new markets for TV sets, mainly in Egypt and East Africa.

Despite the declining market for electronic components, imports are projected to climb rapidly, reaching $1.8 billion in 1985. Exports should also rise markedly to more than $2 billion, reflecting Singaporean firms' considerable reexport activity.

U.S. companies, with their massive technology base, can look forward to import sales increases averaging about 27 percent yearly (see table 2) as Singapore's electronics industry moves from quantity to quality items. Sales of U.S.-made passive components are forecast to shoot up at 39 percent a year in the 1981-85 period to $210 million in 1985, almost a third of the product category import market. Shipments of U.S.-made semiconductors are projected to climb 20 percent annually to $90 million in 1985, representing about 12 percent of imports in this product category.

End-Users

Singapore's 16-year-old electronics industry accounts for the second largest share of GNP, superseded only by the petrochemical industry. Total 1980 production of the 38 electronics companies amounted to $1.1 billion (see table 3).

Recognizing the country's vulnerability to recessionary spread and trade barriers from the industrialized West, the Government is consciously moving the electronics industry into the manufac-

Table 1.—Singapore: The market for electronic components, 1978-82 and projected 1985

(in millions of U.S. dollars)

					Projected	
	1978	1979	1980	1981	1982	1985
Passive components						
Local production	43	82	102	110	130	185
Imports	119	223	309	363	436	635
Exports (less)	28	122	110	149	179	310
Total	134	183	301	324	387	510
Semiconductors						
Local production	498	612	745	745	745	745
Imports	242	336	413	517	620	1,070
Exports (less)	590	752	800	787	945	1,630
Total	150	196	358	475	420	185
Electron tubes						
Local production	35	46	57	61	76	120
Imports	23	49	44	62	73	140
Exports (less)	2	5	29	37	44	85
Total	56	90	72	86	105	175
Total market						
Local production	576	740	904	916	951	1,050
Imports	384	608	766	942	1,129	1,845
Exports (less)	620	879	939	973	1,168	2,025
Total	340	469	731	885	912	870

Note: Market size equals production plus imports (c.i.f.) minus exports (f.o.b.). Passive components include electromechanical components, transducers, wires and cables, etc. Production figures include values for in-house production.

Source: Market interviews; Singapore Half-Yearly Trade Statistics, Jan.-June 1979—Imports and Exports Vol V, No. 1 published by the Department of Statistics, Singapore; and International Trade Administration, Office of Trade Information Services, research study, "A Survey of the Market for Electronic Components in Singapore," (see Additional Information box).

Source: "A Survey of the Market for Electronic Components in Singapore," Applied Research Corporation. 303 Tanglin Road, Singapore 1024, Republic of Singapore, June 1982, prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box), and desk research.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=S$2.43 (1977), S$2.27 (1978), and S$2.17 (1979 and subsequent years). Values for years through 1979 are given in current dollars; values for 1980 and subsequent years are given in 1980 constant dollars.

Table 2.—Singapore: Imports of electronic components by country of origin, 1978-82 and projected 1985

(in millions of U.S. dollars)

	1978	1979	1980	1981	1982	Projected 1985
Passive components						
United States	13.1	27.9	41.6	56.7	95	210
Japan	51.3	92.3	134.0	140.4		
Republic of China	6.0	17.4	22.6	22.6		
Germany	9.6	26.9	20.9	19.2		
United Kingdom	4.6	12.5	13.9	14.4		
Other	31.1	45.0	76.3	109.9		
Total	115.7	222.0	309.3	363.2	436	635
Semiconductors						
United States	16.1	18.9	36.0	44.2	53	90
Malaysia	77.2	109.4	174.5	197.2		
Thailand	66.4	89.0	72.6	111.3		
Japan	26.2	48.2	56.3	62.3		
Philippines	—	—	24.5	—		
Other	56.3	70.1	48.7	101.5		
Total	242.2	335.6	412.6	516.5	620	1,070
Electron tubes						
United States	—	0.2	—	—	—	—
Japan	14.9	31.3	27.7	32.9		
Republic of China	4.9	8.9	10.1	18.5		
Germany	1.6	2.9	0.4	4.1		
Malaysia	—	—	0.1	—		
Other	1.2	9.3	8.6	6.5		
Total	22.6	52.6	46.9	62.0	73	140

Source: Singapore Trade Statistics—Imports and Exports, Department of Statistics, Singapore and International Trade Administration, Office of Trade Information Services, research study, "A Survey of the Market for Electronic Components in Singapore".

ture of high-technology products. Prime importance is attached to the industrial electronics sector, which now accounts for about 5 percent of output; the Economic Development Board estimates the sector will account for 20 percent of output by 1990. Through manpower development programs and financial motivation, the Government is also encouraging electronics companies to go beyond mere manufacturing into full research and development (R&D) functions.

Fiscal incentives have been offered to overseas firms to set up local plants, particularly for the manufacture of test and measuring instruments, data processing and communications equipment, industrial control apparatus, analytical and medical electronic equipment, automotive electronic systems, and electronic materials. Development offers have been accepted by several major producers including Apple Computer (microcomputers and computer peripherals); Digital Equipment Corporation (DEC—minicomputers); MicroPeripherals Inc. (disk drives and printers); Olivetti (electronic office equipment); and Texas Instruments and SGS-ATES (semiconductor wafer fabrication). All these businesses originate in the United States except Olivetti and SGS-ATES, based in Italy.

Table 3.—Singapore: End-user sector economic indicators, 1980

	Total number of companies	No. of companies accounting for 20% of production	No of companies accounting for 50% of production	Value of production ($ millions)	Capital expenditures ($ millions)
Consumer electronics	27	20	8	1,000	131
Automotive electronics	2	1	1	52	22
Test equipment	3	3	—	7	
Communications equipment	NIL	—	—	—	
Industrial electronics	NIL	—	—	—	
Medical electronics	1	—	—	14	
Computer and business systems	4	3	2	Just started	
Military/aerospace equipment	1	—	—	Production starts in 1984/85	NA

Source: Based on the annual reports of the Singapore Electronics Industry Association, report by the Board for Industrial Developments, annual reports of the major firms and industry and trade professional estimates, Economic Development Board, Singapore, end-user interviews, and International Trade Administration, Office of Trade Information Services research study, "A Survey of the Market for Electronic Components in Singapore".

Consumer products.—Although the worldwide recession has reduced exports of TV sets, cassette recorders, and similar items, the 27 companies making up the consumer products sector still dominate the electronics industry, with 1980 output totaling $1 billion. Eight firms account for half of production. Audio products are made primarily by Sanyo Electronics, Aiwa/Atlas Electronics, Asahi Electronics, JVC Electronics, and Matsushita Electronic. Major audio/video producers include Setron Ltd., Philips Singapore, General Electric (GE—United States), Consumer Electronics, and Roxy Electric Industries. Of these, Philips, GE, and Matsushita produce their own components.

The Government is working to achieve a fully integrated electronics industry, concentrating R&D efforts in consumer goods on high-technology products such as audio and video machines, home computers, and electronic musical instruments. In addition, many consumer electronics products are being developed from basic conceptual designs. Research is being carried out on oscilloscopes, programmable calculators, microwave radio links and field telephones, liquid crystal displays, programmable thermostats, carbon film resistors, electrolytic capacitors, top-end amplifiers, and preamplifiers.

Companies are also encouraged to "backward integrate" into the manufacture of key components and subassemblies. Examples include cassette mechanisms, TV picture tubes, and quartz crystals and batteries for watches and liquid crystal displays. With rising wage costs, the assembly of finished products such as TV sets is forecast to decrease, but the manufacture of TV picture tubes for export is predicted to rise. Hitachi, already making a wide range of 14- to 20-inch color TV tubes, plans to increase production in the next few years. Although the consumer electronics sector is expected to account for a smaller share of the components market—56 percent in 1985 compared to 91 percent in 1980 and 73 percent in 1981—purchases are predicted to rise 5 percent annually to $470 million in 1985 (see table 4).

Automotive electronics systems.—With high priority being given by the Government to the development of automotive electronics systems, the sector's use of components is forecast to rise from $19 million in 1981 to $45 million in 1985, a 24 percent yearly increase. In 1985 the sector is expected to consume more than 5 percent of electronic components. Two firms, GM Singapore and Motemtronic, generated $52 million in automotive electronics output in 1980, and GM Singapore, which manufactures its own components, expects to double its production of car stereos and automotive electronics in 2 years' time.

Table 4.—Singapore: The market for electronic components by selected end-user sector, 1980-81 and projected 1985

(in millions of U.S. dollars)

	1980	1981	Projected 1985
Consumer electronics	439	386	470
Automotive electronics	15	19	45
Test equipment	16	13	20
Communications equipment	—	—	—
Industrial electronics	—	—	—
Medical electronics	10	13	20
Computers and business systems	3	101	290
Military/aerospace equipment	—	—	—
Total	483	532	845

Source: Singapore official production and trade statistics, trade source evaluations, a study by the Singapore Industrial Board, end-user interviews, and International Trade Administration, Office of Trade Information Services research study, "A Survey of the Market for Electronic Components in Singapore".

Computers and business systems.—Computer firms, which should account for more than a third of electronic components absorbed in 1985, are expected to lift Singapore's electronics industry out of the pull of worldwide recession. As recently as 1980, computer and business systems firms accounted for less than 1 percent of electronic components consumed. Now use of components in the sector is projected to escalate at a 30 percent annual rate from $101 million in 1981 to $290 million in 1985. Major computer companies active in Singapore include DEC International, Far East Computers, and Apple Computers Singapore, which plans a $30 million expansion in 1982-83.

Market Profiles

Although Singapore has a flourishing electronic components industry, from 50 to 70 percent of output is exported, leaving a substantial demand for imports, particularly of high-technology items. Local suppliers expect to increase production an average 3.5 percent annually from $916 million in 1981 to just over $1 billion in 1985; primarily in capacitors, resistors, printed circuit boards (PCB's), and wire and cable. However, the rapid growth of the electronics industry is creating opportunities for local entrepreneurs to venture into the manufacture of photomasks, computer floppy disk drives, semiconductor testing equipment, carbon film and metal film resistors, and electrolytic capacitors.

Imports are forecast to rise an average 18 percent annually from $942 million in 1981 to more than $1.8 billion in 1985, but a significant portion is reexported. Malaysian suppliers led the import market in 1981 with 26 percent of foreign sales, followed by Japanese manufacturers with 25 percent and U.S. vendors with 11 percent. Relying on their technological leadership, U.S. firms expect shipments to escalate from $101 million in 1981 to $305 million, or 16 percent of imports, in 1985. American products are known for dependability, consistently good quality, and proven applications. On the negative side, U.S.-made products usually cost more than those of competitors and, because of distance, normal delivery times may not be satisfactory. In addition, U.S. companies often expect minimum orders that are beyond the requirements of many end-users, while Japanese firms are willing to accept small orders.

Passive components.—Sales of passive components are predicted to increase from $324 million in 1981 to $510 million in 1985. Imports, expected to grow 15 percent yearly to $635 million in 1985, meet most of the demand, with U.S. firms second only to Japanese suppliers. The Government has encouraged local manufacture of connectors, relays and switches, high-grade capacitors, resistors, potentiometers, quartz crystals and filters, and high-grade PCB's. More than 90 percent of the domestic producers are foreign owned.

The market for **capacitors** is expected to grow more than 16 percent a year to $150 million in 1985 (see table 5). Vendors in the United States and Japan lead this market segment, with total imports projected to rise from $80.8 million in 1981 to $168 million in 1985. Local capacitor manufacture is mostly confined to ceramic and electrolytic types. National Kap and Wycap Electronics, the two major locally-owned electrolytic capacitor manufacturers, were responsible for about 7 percent of output in 1980. The primary multinational companies making capacitors in Singapore include four Japanese firms—Murata Electronic and Singapore KCK (ceramic), Rubycon (aluminum electrolytic), and Electrical Manufacturers of Singapore (polystyrene)—and two German-owned concerns—Siemens Components (aluminum electrolytic) and E. Hopt (air variable).

Connectors are expected to provide the fastest growing sales in the passive components product category, with a 21-percent annual growth rate and 1985 sales of $140 million, up from a $65.1 million in 1981. Imports, which outweigh local production by about 5 to 1, are projected to rise 20 percent annually between 1981 and 1985. U.S. and Japanese firms dominate foreign supply, with Molex (United States) selling an estimated $11.7 million to $14 million worth of connectors in 1980. Important foreign companies manufacturing in Singapore include Japan's Taiko Electronics (connectors and wire harnesses) and three U.S. firms, Molex Singapore (terminals, connectors, switches, and IC sockets), DuPont Singapore (terminals), and Pressac Singapore (terminals and connectors).

Sales of **filters, networks, and crystals** are projected to increase only 5.4 percent annually to $9 million in 1985. Local production dominates in this area, accounting for $6 million of the $7.3 million in 1981 total sales. Reexports, mostly to Hong Kong and Taiwan, accounted for about 93 percent of the 1981 exports of $600,000. Two U.S.-owned firms, HY-Q International Singapore (quartz crystal units, filters, and oscillators) and Rakon (quartz crystals), lead the domestic suppliers.

Strong demand is forecast for **magnetics,** with sales predicted to burgeon over 19 percent annually in the 1981-85 period, from $55.2 million to $111 million. Imports, which are expected to increase 20 percent a year to $138 million in 1985, supply most of the market, with Japan's Toko Electronic the major foreign shipper. Japanese companies dominating the foreign-owned local manufacturing segment include Hitachi Consumer Products (flyback transformers), Matsushita Electronic Components (IF, AF, and flyback transformers), Toko Electronic Singapore (IF transformers), NMB Singapore and Singapore Kami Electronics (power transformers), and Sumida Electric (IF transformers and antennae coils).

Single-layer **printed circuit boards** (both single and double sided) make up most of the PCB's manufactured locally in Singapore. In the future, double-sided plated through-hole PCB's are expected to be in demand. High-grade PCB's for computers and telecommunications are manufactured only by the local subsidiary of Printed Circuits International (United States), and 90 percent of their output is exported to the United States. Other foreign firms manufacturing in Singapore include Hitachi Chemical (Japan), Wong's Circuits (Hong Kong), and Demetron (Germany). Six to eight local companies, including Pentex Circuit, Print & Etch, and Essex Circuit, each commanding less than 10 percent of the market, produce medium-grade PCB's for TVs and robotics and low-grade PCB's for cassette recorders and TV games.

Sales of **readout devices** are projected to rise 9 percent yearly to a 1985 level of $28 million, with photophosphorescent displays in particular demand. Imports are expected to increase almost 20 percent annually to $21 million in 1985; U.S. and German firms lead this market segment. Local production of displays is dominated by U.S.-owned firms, including Hewlett-Packard, which produces light emitting diodes (LED's), and PCI Displays, which manufactures liquid crystal diodes (LCD's) and modules.

Several foreign firms are major producers of **relays** in Singapore. European Standard Electronics (France) manufactures current on-off type relays entirely for export back to France. Fujitsu

Table 5.—Singapore: The market for electronics components by product category, 1978-82 and projected 1985

(in millions of U.S. dollars)

	1978	1979	1980	1981	1982	Projected 1985
Passive components						
Capacitors						
Local production ...	23.2	31.0	38.0	41.0	46.0	65
Imports	33.3	45.1	57.5	80.8	97.0	168
Exports	14.1	11.5	18.0	39.7	48.0	83
Total	42.4	64.6	77.5	82.1	95.0	150
Connectors						
Local production ...	—	10.5	13.0	14.0	17.5	34
Imports	—	58.0	71.1	76.3	91.6	158
Exports	—	31.4	20.9	25.2	30.2	52
Total	—	37.1	63.2	65.1	78.9	140
Filters, networks, and crystals						
Local production ...	—	4.5	5.6	6.0	6.0	6
Imports	—	2.9	6.6	1.9	2.3	4
Exports	—	0.1	0.5	0.6	0.7	1
Total	—	7.3	11.7	7.3	7.6	9
Magnetic						
Local production ...	6.4	8.5	10.5	11.3	13.0	20
Imports	27.6	37.9	56.6	66.3	79.6	138
Exports	0.7	4.2	12.0	22.4	26.9	47
Total	33.3	42.2	55.1	55.2	65.7	111
Readout devices						
Local production ...	10.7	14.2	17.6	19.0	26.6	27
Imports	1.7	6.6	8.0	10.2	12.2	21
Exports	2.3	6.1	13.4	9.4	11.3	20
Total	10.1	14.7	12.2	19.8	27.5	28
Resistors						
Local production ...	—	6.2	7.7	8.3	10.0	17
Imports	—	27.3	29.3	39.4	47.3	82
Exports	—	8.8	15.4	20.0	24.0	42
Total	—	24.7	21.6	27.7	33.3	57
Switches						
Local production ...	—	4.1	5.1	5.5	6.1	8
Imports	—	30.4	43.0	42.2	50.6	87
Exports	—	12.5	20.8	18.4	22.1	38
Total	—	22.0	27.3	29.3	34.6	57
Wire and cable						
Local production ...	2.4	3.2	4.0	4.3	4.7	6
Imports	56.7	14.4	27.1	45.9	55.1	95
Exports	10.4	4.7	9.2	13.1	15.7	27
Total	48.7	12.9	21.9	37.1	44.1	74
Semiconductors						
Discrete devices						
Local production ...	73.3	51.0	47.4	47.4	47.4	47
Imports	76.1	110.5	135.6	158.5	190.2	329
Exports	88.7	69.9	88.2	98.6	118.3	204
Total	60.7	91.6	94.8	107.3	119.3	172
Integrated circuits						
Local production ...	425.1	561.1	697.2	697.2	697.2	697
Imports	166.2	225.1	277.0	358.0	429.6	742
Exports	500.8	2.3	712.1	688.6	826.3	1,428
Total	90.5	103.9	262.1	366.6	300.5	11

Table 5.—Singapore: The market for electronics components by product category, 1978-82 and projected 1985 (cont.)

(in millions of U.S. dollars)

	1978	1979	1980	1981	1982	Projected 1985
Electron tubes						
TV picture tube, B&W						
Local production	6.0	7.9	9.8	10.6	12.0	17
Imports	NA	15.6	11.5	13.8	16.1	31
Exports	NA	1.0	3.0	3.5	4.1	8
Total		22.5	18.3	20.9	24.0	40
TV picture tube, color						
Local production	29.0	38.0	47.0	50.8	63.5	102
Imports	NA	33.9	32.0	48.2	56.4	110
Exports	NA	4.2	26.2	33.7	39.4	77
Total		67.7	52.8	65.3	80.5	135

Source: International Trade Administration, Office of Trade Information Services research study, "A Survey of the Market for Electronic Components in Singapore".

(Japan) makes mercury and miniature relays; Triridge (Singapore) of the United States produces epoxy encapsulated reed relays; and S&T Enterprises (Japan) also supplies relays.

A healthy market is forecast for **resistors**, with sales expected to climb from $27.7 million in 1981 to $57 million in 1985. Demand for resistors, especially thick film resistance devices, is growing as consumer electronics firms cut back on low-value labor-intensive products in favor of products in the higher end of the market. Manufacturers in the United States, Japan, and Germany are the major foreign suppliers. ASJ (United States) shipped $4.3 million in resistors to Singapore in 1980, 90 percent of which were then reexported. Local production of resistors, forecast to rise almost 20 percent annually to $17 million, is dominated by U.S.-owned firms, including ASJ Pte Ltd. (fixed carbon film and metal film) and PREH Singapore (variable resistors). In addition, Siemens Components produces photoresistors, E. Hopt makes variable resistors, and Matsushita Electronic Components manufactures carbon film and metal oxide resistors. Local suppliers, including Presco and Yong Lee & Co., produce mainly carbon film and metal film resistors and find it difficult to penetrate new markets or diversify into more sophisticated end-products.

The market for **switches** is projected to rise at a healthy 18 percent annual rate, from $29.3 million in 1981 to $57 million in 1985. Imports, which vastly outweigh local production, are forecast to grow almost 20 percent a year to a 1985 level of $87 million. Exports also should rise at a 20-percent annual rate, reaching $38 million in 1985, again assuming some reexporting. Major local producers include Matsushita Electronic Components, Mitsumi Electronics (Japan), and Electronic Components Associates (France).

A good market is forecast for **wire and cable** vendors, with sales predicted to grow almost 19 percent a year to $74 million in 1985. Local production is expected to increase only about 9 percent annually, but imports should to climb at a 20-percent annual rate. M/S Epan Cable & Wire and Hung Kee Hong Electronics and Wires, manufacturers of shielded and unshielded multistrand and screened wires, supplied about 25 percent of domestic wire and cable production in 1980. Major foreign suppliers, mostly Japanese, have the advantage of being able to supply in large quantities and to precut lengths demanded by the consumer electronics industry. Most locally produced **fractional horsepower motors** come from Matsushita Electronic Components, Mitsumi Electronics, and Sankyo Seiki, another Japanese firm.

Semiconductors.—Market researchers believe that sales of semiconductors could drop from $475 million in 1981 to $185 million in 1985 as the industry experiences the full effect of recession in the industrialized consumer countries. Integrated circuits currently comprise about 77 percent of the market, while discrete devices make up the remaining 23 percent. Low demand for integrated circuits is given as the reason for the projected 95-percent decrease in semiconductor sales by 1985. Sales of discrete devices are expected to rise 12.5 percent annually to $172 million in 1985.

Imports of semiconductors are projected to grow 20 percent yearly, with 1985 levels reaching $742 million for integrated circuits and $329 million for discrete devices. Exports are also forecast to climb at a 20-percent annual rate, with 1985 levels exceeding $1.4 billion for integrated circuits and $204 million for discrete devices. Exports greatly exceed local production, particularly for discrete devices. Most of the reexports are bound for Indonesia, about 80 percent in the case of discrete devices.

Malaysian companies dominate foreign supply of semiconductors with 38 percent of imports. Firms in Thailand claim 21.5 percent of imports and U.S. suppliers almost 9 percent. With the United States recognized as the world leader in semiconductor technology, imports of U.S.-made semiconductors are projected to rise from $44 million in 1981 to $53 million in 1985. Major foreign suppliers of integrated circuits include National Semiconductor, Texas Instruments, Thomson-CSF/Components, and ITT (all U.S. producers), SGS-ATES, and Siemens.

The 11 integrated circuit manufacturers and 5 discrete device firms operating in Singapore in 1980 met about 15 percent of local needs in discrete devices and 26 percent in integrated circuits. About half the domestic production of integrated circuits is attributable to U.S. multinational corporations, including National Semiconductor, Fairchild, Texas Instruments Singapore, Electronic Components of GE, Intersil, and Honeywell-Synertek. SGS-ATES Singapore, Siemens Components, and Japan's NEC Singapore also participate in local semiconductor manufacture.

Generally, these companies produce components for the computer and military sectors, with promising sales in the industrial automation market. Memory (CMOS RAM) components and microcomputer logic integrated circuits are now in production. National Semiconductor and Siemens are preparing to make 64K RAMS in Singapore, and Texas Instruments and SGS-ATES are setting up wafer diffusion plants.

Electron tubes.—Strong demand is predicted for electron tubes, with sales rising from $86 million in 1981 to a projected $175 million in 1985. Imports, which accounted for 72 percent of sales in 1981, are expected to cover 80 percent of the demand by 1985. Exports, forecast to grow 23 percent yearly, are also expected to take up a growing share of local production, almost 71 percent by 1985. Vendors in Japan and Taiwan are the major foreign suppliers, the former with more than 50 percent and the latter with almost 30 percent of electron tube imports in 1981. U.S. firms send practically no electron tubes to Singapore. Healthy growth is forecast for local production, which is expected to reach $120 million by 1985.

In response to the growing demand for television in new Third World markets, sales of black and white TV picture tubes are expected to rise almost 18 percent yearly to $40 million in 1985; sales of color TV picture tubes are projected to increase almost 20 percent yearly to $135 million in 1985. Demand for picture tubes has echoed political decisions within Singapore's export market. A high of $90 million in picture tube sales was reached in 1979 with large orders of black and white TV sets from China. When changes in China's foreign and economic policies put a stop to TV imports in 1980, Singapore's sales of TV picture tubes fell dramatically to $71 million.

Color tubes accounted for 75 percent of sales in 1981 and by 1985 should claim about a 77-percent share. Singapore's production of TV picture tubes is largely for export, about half for assembly in other countries, primarily Taiwan and Japan. A larger proportion, including some reexports, end up in TV sets that are ultimately exported. Most of the imported picture tubes are purchased directly from manufacturers for assembly into TV sets.

Only cathode ray TV tubes and microwave oven tubes are manufactured in Singapore. Microwave hardware is not commonly used in the country, and the Ministry of Defense, the Telecommunications Authority, and to a lesser extent, Shell Eastern Petroleum, which uses a microwave communications system to its headquarters in The Hague, provide the only significant local consumption. SATNAV and Magnavox are both distributed by Singapore Electronic and Electrical Engineering, a quasi-government company.

Business Practices

Most sales in the electronics industry are made directly to the end-user. Retail sales occur infrequently, usually only to small research laboratories and government technical institutions.

Major purchasing criteria include price, quality, delivery, and service. Many of the U.S. and Japanese multinational companies operating in Singapore purchase components from their respective parent companies, although they are not bound to do so.

Advertising is confined to trade, business, and professional journals. Many end users also attend trade fairs, and both end users and manufacturers go on trade missions to other countries.

Tariffs and Standards

No customs duties, government regulations, or official approvals pertain to import sales of electronic components. The Singapore Institute of Standards and Industrial Research has published a Singapore Standard which covers ratings, test conditions, and requirements of aluminum foil polarized liquid electrolytic capacitors, mainly for commercial use in DC electronic circuits.

Singapore: Basic Economic Indicators

Population:	2.5 million (1982)
Area:	618 sq. km.
GDP:	$10.5 billion (1981)
Contributions to GDP:	Services 62% (1980) Industry 37% Agriculture 1%
Per capita income:	$4,340 (1980)
Inflation rate:	5.1% (1980)
Exports f.o.b.:	$19.4 billion (1980)
U.S. share:	12.7% (1980)
Imports c.i.f.:	$24.0 billion (1980)
U.S. share:	14.1% (1980)
Major trading partners:	Malaysia, United States, Japan, Hong Kong, Thailand, Germany, Australia, Indonesia, Saudi Arabia
Exchange rate:	2.14 Singapore $=US$1 (1980)
Fiscal year:	April 1-March 31
Current account balance:	−$1,577 million (1980)
International reserves:	$6,567 million (1980)
Federal budget	
revenues:	$3.1 billion (1980-81)
expenditures:	$2.9 billion (1980-81)
Labor force:	1.1 million (1981)
Unemployment:	3.9% (1981)
Average hourly wage:	$1.24 (1980)

Additional Information

The project officer responsible for Country Market Surveys on electronic components is:

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The Survey summarizes a 70-page research report prepared by Applied Research Corporation, Republic of Singapore, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

International Market Research Services
OTIS/ITA, Rm. 1320
U.S. Department of Commerce
Washington, D.C. 20230

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Singapore

CMS/SGR/559/83; June 1983

CMS

Country Market Survey

Sporting Goods and Recreational Equipment

Singapore

DEPOSITORY
JUL 14 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Compared to the rest of the world, Singapore maintained an enviable high economic growth rate during 1982. Real gross domestic product (GDP) grew at 6.5 percent annual rate and inflation fell to less than half the 1981 rate (10.4 percent). The Government of Singapore has adopted a moderately expansionary policy to maintain domestic demand and should be able to maintain economic growth of five to six percent over the next few years. Singapore's economy is generally thought to lag six to nine months behind the U.S. business cycle. Singapore's per capita income, nearly $6,000 is second highest in Asia, promising a strong market for sporting goods and recreational equipment.

The government has been active in establishing sports complexes, swimming pools, and keep-fit centers in private residential and public housing areas as well as providing all types of sports facilities in Community Centers. The Singapore Sports Council (SSC) has also been actively promoting and implementing its "Sports for all" policy since it was created in 1973. The broad objectives of this policy are to instill sports consciousness, raise the level of physical fitness, and encourage the attainment of high standards of performance. Besides providing the largest number of sports facilities, the Council also promotes and organizes national competitive events, as well as operating many sports training programs. These have all contributed to the growth of the sports equipment industry into a multimillion dollar business.

The other factors contributing to a growing demand for sporting goods and recreational equipment are:

- Singapore's status as a free port and entrepot servicing a wide geographic area.
- the composition of its population, more than 50 percent are below the age of 30 and more than 80 percent have undertaken some form of sporting activity.
- the government's interest in encouraging every person to become interested in some sort of game or exercise.
- a high per capita income makes Singaporeans Southeast Asia's wealthiest and healthiest people, with money and time to play.
- a massive annual influx of tourists, many of whom are attracted by the country's free port status (in 1981 about 2.8 million tourists visited Singapore and the number is expected to increase to some 3 million in 1982).
- A pleasant year-round climate particularly favorable for outdoor sports.

The market in 1981 was $23.4 million.[1] Local production amounted to $7.6 million. The market is estimated to reach $26.6 million in 1982, and soar to 32.8 million in 1986.

Under current market conditions, there exists a excellent potential for increasing imports from the U.S. in:

- golf equipment
- tennis, squash and badminton rackets
- outboard motors and marine accessories
- gymnasium, gymnastic and exercise equipment

Moderate demand can be anticipated for imports from the U.S. in:

- Archery equipment and skates
- Billiards and pool equipment
- Trailers for camping (all for reexport)

Competitive Environment

Despite competition from low labor cost countries, the excellence and prestige of American equipment in the upper end of the market is creating new and expanded opportunities for U.S. suppliers. Many wholesalers and importers are actively seeking to expand their product lines as American goods are proving to enjoy substantial appeal with the Singapore public. Part of the growth in the United States' share of the Singapore import market is also attributable to an apparent increase in merchandising by American sporting goods and recreational equipment manufacturers. This is particularly apparent in golfing, water sports, archery and tennis—sports in which overseas buyers, including those in Singapore, have always been interested.

Domestic manufacturing of sporting goods and recreational equipment is limited. Only fiberglass tennis rackets and fishing equipment, as well as some sporting accessories, are locally produced. More than 90 percent of such production is exported.

Product Market Profiles

Water Sports Equipment.—The market in Singapore for this product category includes outboard motors, water skis and accessories, scuba-diving equipment, swimming pool and fishing equipment. This sector of the sports is mostly involved with the upper income people, except for swimming and fishing. The demand is expected to increase through 1986. U.S. suppliers captured the major share in the outboard and marine engines (about 70 percent in 1981). They are expected to maintain the leading position through 1986.

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[1] All values are given in U.S. Dollars. Local currency is converted at the following exchange rates: U.S.$ =+ S$ 2.20 (1980) and S$ 2.13 (1981).

Golf Equipment.—The U.S. commanded about 44 percent share of the total 1981 import of some $5.3 million. The technical characteristics and design features of U.S. equipment are particularly attractive to most of the golfing enthusiasts who tend to select quality brands irrespective of price.

Equipment for Racket Sports.—The U.S. commanded a 21 percent share of the total 1981 imports of some $10 million. The U.S.-made racket encounters stiff competition from the Japanese and British. Generally local purchasers tend to be more quality than price conscious. The Japanese and British products are very popular among educational institutions and students, and account for about 40 percent of the total market in this sector. Good market potential continues to exist for this product category as the government proceeds to provide new sports facilities throughout the period 1982–1986. At least 12 squash courts, 10 tennis courts and 5 sports complexes will be added during this period.

Bicycles for Cycling/Archery Equipment, Skates, Gymnasium, and Exercise Equipment.—U.S. suppliers of this category captured about 11 percent share of the total import value of 4.6 million in 1981. The Taiwanese and Japanese are the main suppliers with $1.4 million and $0.9 million shares respectively in 1981. By 1986, the total imports for this group will be expected to reach $7 million at an average annual growth rate of 10% between 1981 and 1986.

Inflatable Balls/Volleyball/Baseball/Softball Equipment.—The Japanese are the leading suppliers for this product group with an average of 83 percent of total imports of $4.5 million in 1981. The U.S. share was 4 percent. The U.S. products are usually higher priced.

Billiards & Pool Equipment.—The Australian and Taiwanese suppliers are leading in sales of this product group with 34 percent and 18 percent share respectively in 1981 as against the U.S.'s 13% share which is dominated by sales of pool equipment.

Trailers for Camping.—This category is mainly for reexport. In 1981 the total import was $258,000 with 44 percent share from U.S. suppliers, followed by Japan with 30 percent. Imports are expected to reach $500,000 by 1986.

Profile of Sports and Recreational Activities

Educational Institutions.—About 25 percent of Singapore's population of 2.3 million are in schools, colleges and institutes of higher learning, which include the National University of Singapore, the Nanyang Technical Institute, the Singapore Polytechnic, the Institute of Education and the Ngee Ann Technical College. In addition, each school which has an enrollment of about 800 students, has a "supplemental school fund" for the purchase of sports and other equipment. This fund approached $1.5 million in 1981. The key sports activities promoted in schools are: field athletics, badminton, basketball, gymnastics, soccer, softball, swimming, table tennis, tennis, volleyball, rugby and netball.

The Armed Forces.—Major games played by the armed forces are comparable to educational sports, with the addition of squash and shooting. There are about 5,000 participants for each game.

Private Clubs/Community Centers.—In 1981 there were about 85 various private clubs (excluding health clubs in hotels) and 72 community centers with 23 golf courses, 280 tennis courts, 740 badminton courts, 192 squash courts, 81 basketball courts and 21 foot fields. In addition, there are other sports facilities such as archery, billiards, cricket, hockey and swimming pools, etc.

Tourist.—In 1981, tourist arrivals totalled about 2.8 million which exceeded that of Hong Kong, previously the top tourist attraction in Asia. The tourist industry is expected to rise in view of the extensive activities the Singapore Tourist Promotion Board is undertaking in various parts of the world. Singapore's annual tourist influx is expected to exceed 3 million in 1982.

The development of tourist attractions on the mainland as well as the opening of several offshore islands for recreational use will predictably enhance the demand for sporting goods and recreational equipment.

There are about 200 sports shops in Singapore. Most of those interviewed commented that more than 50 percent of their customers are tourists, mainly from Indonesia, Malaysia and Australia.

As a result, the net apparent market shown in Table 1 actually includes consumption by tourists.

Table 1: Singapore: Apparent Market for Sporting Goods & Recreational Equipment

(in thousands of US$)

Major Product Categories	1980	1981	1982	1986
Equipment for Racket Sports				
Domestic Production	1,500	3,100	4,000	5,000
Imports	12,926	10,038	12,000	15,000
Exports	3,157	4,437	6,000	8,000
Net Apparent Market	11,269	8,701	10,000	12,000
Golf Equipment				
Domestic Production	—	—	—	—
Imports	4,696	5,267	6,000	9,000
Exports	595	318	600	2,100
Net Apparent Market	4,101	4,949	5,400	6,900
Fishing & Hunting Equipment				
Domestic Production	2,600	4,200	5,000	7,000
Imports	2,234	3,898	4,000	5,000
Exports	4,401	5,420	6,000	8,000
Net Apparent Market	433	2,678	3,000	4,000
Bicycles				
Domestic Production	—	—	—	—
Imports	1,503	1,573	1,700	2,200
Exports	1,400	1,217	1,300	1,600
Net Apparent Market	103	356	400	600
Archery Equipment & Skates				
Domestic Production	—	—	—	—
Imports	1,512	2,236	2,500	3,500
Exports	638	845	900	1,600
Net Apparent Market	874	1,391	1,600	1,900
Gymnasium, Gymnastic & Exercise Equipment				
Domestic Production	80	30	50	80
Imports	438	763	900	1,300
Exports	230	304	400	700
Net Apparent Market	288	489	550	680
Inflatable Balls				
Domestic Production	—	—	—	—
Imports	2,028	2,160	2,300	2,800
Exports	545	859	900	1,200
Net Apparent Market	1,483	1,301	1,400	1,600
Volleyball, Baseball/ Softball Equipment				
Domestic Production	—	—	—	—
Imports	1,669	2,290	2,400	3,000
Exports	400	480	500	900
Net Apparent Market	1,269	1,810	1,900	2,100
Billiard & Pool Equipment				
Domestic Production	30	20	30	60
Imports	240	136	150	300
Exports	74	30	40	80
Net Apparent Market	196	126	140	280
Outboard & Marine Engines				
Domestic Production	—	—	—	—
Imports	1,730	2,185	3,150	4,500
Exports	850	500	900	1,800
Net Apparent Market	880	1,685	2,250	2,700
Trailers for Camping				
Domestic Production	18	284	310	500
Imports	52	258	350	500
Exports	70	542	660	1,000
Net Apparent Market	—	—	—	—
GRAND TOTAL				
Domestic Production	4,228	7,634	9,390	12,640
Imports	29,028	30,804	35,450	47,100
Exports	12,360	14,952	18,200	26,980
Net Apparent Market	20,896	23,486	26,640	32,760

Exchange Rate: US$1.00 = S$2.20 – 1980
US$1.00 = S$2.13 - 1981

Source 1): Singapore Trade Statistics, Department of Statistics.
2): Interviews

Marketing Practices

- Independent agents/importers/wholesalers
- Purchasing organizations for department stores and other large retail chains
- Manufacturers who import goods under their private lable or import parts for incorporation in their products.

Until recently, products were most commonly imported by a manufacturer's representative who sold them to a wholesaler, who in turn sold them to the retailer. There is a growing tendency, however, to by-pass the wholesaler; importers frequently supply retail outlets directly.

While non-exclusive agreements are common, an exclusive agreement with a large importer is the best form of representation for adequate market servicing and coverage.

Department stores tend to carry smaller-sized items such as tennis and golf equipment, sporting balls and camping supplies. Sporting goods stores and equipment rental stores stock, in addition, supplies for more specialized sports such as diving, archery and skiing equipment, and items which require after-sales servicing: firearms, diving regulators, etc. Some products for golf and tennis, water skiing and saddlery may be rented or purchased at the place of activity.

Department stores that offer a wider range of products have increased their share of retail sales. Several import on a direct basis, though products imported in this way are usually cheaper and involve lesser-known brands. Approximately 20 percent of retail sales are by department stores, 50 percent by independent sporting goods stores and the remaining 30 percent by hardware stores, variety stores and other retail outlets, including pro shops run by associations.

Trade Regulations

Import Duties.—There are no import duties for any of the products under research.

Local Protection.—None of the items produced locally enjoy any protection in the form of tariffs or quotas levied against imported items.

Special Technical Standards or Labelling Requirements.—There are no special technical standards or labelling requirements to which imported products must conform by law or regulation or to which conformity is commercially desirable.

Table 2: Singapore: Imports of Sporting Goods & Recreational Equipment — By Country of Origin

(in thousands of US$)

Major Product Categories	1980	Mkt Share	1981	Mkt Share	1982	Mkt Share	1986	Mkt Share
Equipment for Racket Sports								
USA	1,846	14%	2,130	21%	2,500	21%	3,700	25%
Japan	5,212	40	3,212	32	3,600	—	4,000	—
U.K.	2,273	18	1,533	15	2,000	—	2,000	—
Taiwan	1,480	12	809	8	1,000	—	1,400	—
China	409	3	676	7	800	—	1,000	—
Australia	549	4	603	6	800	—	1,000	—
Others	1,157	9	1,075	11	1,300	—	1,900	—
	12,926	100%	10,038	100%	12,000	100%	15,000	100%
Golf Equipment								
USA	1,846	39%	2,301	44%	2,400	40%	3,500	39%
Japan	1,225	26	1,231	23	1,300	—	2,100	—
Australia	825	18	1,046	20	1,100	—	1,500	—
U.K.	307	7	450	8	500	—	800	—
Others	492	10	239	5	700	—	1,100	—
	4,696	100%	5,267	100%	6,000	100%	9,000	100%
Fishing & Hunting Equipment								
USA	97	4%	211	5%	300	8%	600	12%
Japan	647	29	1,192	30	1,500	—	1,800	—
Norway	656	29	726	19	800	—	1,000	—
Taiwan	90	4	106	3	200	—	400	—
China	20	1	31	1	50	—	100	—
Others	724	33	1,632	42	1,150	—	1,100	—
	2,234	100%	3,898	100%	4,000	100%	5,000	100%
Bicycles								
USA	—	0%	—	0%	—	0%	—	0%
Taiwan	943	63	717	46	750	—	800	—
Japan	413	28	685	44	700	—	800	—
China	—	—	15	1	20	—	30	—
Others	147	9	156	9	230	—	570	—
	1,503	100%	1,573	100%	1,700	100%	2,200	100%
Archery Equipment and Skates								
USA	243	16%	364	16%	600	24%	800	23%
Taiwan	342	23	549	25	800	—	1,000	—
Japan	118	8	140	6	200	—	500	—
U.K.	61	4	62	3	70	—	200	—
China	13	1	—	0	20	—	30	—
Others	735	48	1,121	50	810	—	970	—
	1512	100%	2,236	100%	2,500	100%	3,500	100%
Gymnasium, Gymnastic & Exercise Equipment								
USA	53	12%	152	20%	200	22%	300	23%
Japan	126	29	84	11	120	—	100	—
U.K.	60	14	93	12	100	—	150	—
Taiwan	31	7	136	18	150	—	200	—

Table 2: Singapore: Imports of Sporting Goods & Recreational Equipment — By Country of Origin—Continued

(in thousands of US$)

Major Product Categories	1980	Mkt Share	1981	Mkt Share	1982	Mkt Share	1986	Mkt Share
China	17	4	—	—	10	—	100	—
Others	151	34	298	39	320	—	350	—
	438	100%	763	100%	900	100%	1,300	100%
Inflatable Balls								
USA	184	9%	130	6%	140	6%	300	11%
Japan	1,552	75	1,694	78	1,700	—	2,000	—
China	68	3	68	3	80	—	100	—
Taiwan	46	2	54	3	60	—	100	—
U.K.	16	1	—	—	10	—	30	—
Others	162	8	214	10	310	—	270	—
	2,028	100%	2,160	100%	2,300	100%	2,800	100%
Volleyball, Baseball/Softball Equipment								
USA	126	8%	55	3%	60	3%	90	3%
Japan	1,313	78	2,004	87	2,010	—	2,500	—
Taiwan	43	3	50	2	60	—	80	—
China	17	1	—	—	20	—	30	—
U.K.	12	1	17	1	20	—	30	—
Others	158	9	164	7	230	—	270	—
	1,669	100%	2,290	100%	2,400	100%	3,000	100%
Billiard & Pool Equipment								
USA	—	0%	17	13%	18	12%	30	10%
U.K.	90	37	23	17	30	—	60	—
Australia	59	25	46	34	60	—	100	—
Taiwan	13	5	25	18	30	—	60	—
Others	78	33	25	18	12	—	50	—
	240	100%	136	100%	150	100%	300	100%
Outboard & Marine Engines								
USA	1,116	65%	1,540	70%	2,000	64%	3,000	67%
Japan	68	4	178	8	250	—	500	—
U.K.	—	—	90	5	150	—	200	—
Australia	—	—	30	1	50	—	100	—
Others	546	31	347	16	700	—	700	—
	1,730	100%	2,185	100%	3,150	100%	4,500	100%
Trailers for Camping								
USA	—	0%	114	44%	200	57%	300	60%
Japan	50	96	77	30	80	—	100	—
Others	2	4	67	26	70	—	100	—
	52	100%	258	100%	350	100%	500	100%
GRAND TOTAL								
USA	5,511	19%	7,014	23%	8,418	24%	12,620	27%
Japan	10,725	37	10,497	33	11,460	32	14,500	—
Taiwan	2,988	10	2,446	8	3,050	9	4,040	—
U.K.	2,819	10	2,268	7	2,880	8	3,470	—
Australia	1,433	5	1,725	6	2,010	6	2,700	—
China	544	2	790	3	1,000	3	1,390	—
Others	5,008	17	6,064	20	6,632	18	8,380	—
	29,028	100%	30,804	100%	35,450	100%	47,100	100%

Exchange Rate: US$1.00 = S$2.20 - 1980
US$1.00 = S$2.13 - 1981

Source 1): Singapore Trade Statistics, Department of Statistics
2): Interviews

Additional Information

The project officer responsible for Country Market Surveys on Sporting Goods and Recreational Equipment is

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This survey is based on a market research brief prepared by the Foreign Commercial Service of the U.S. Embassy In Singapore and reflects the opinions and views of interviewees and not those of the Department of Commerce.

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CMS

Country Market Survey

Telecommunications Equipment

Singapore

DEPOSITORY
JUN 17 1983
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Growing demand from Singapore's commercial, industrial, and housing sectors, plus the need for international communications, is expected to increase expenditures for telecommunications equipment from $106.2 million in 1980 to $222[1] million in 1986 (see table 1). Although the largest sums will continue to go to telephone and telex equipment, the markets for transmission, mobile radio, and data communications equipment are predicted to more than double between 1980 and 1986. Demand for video and radio broadcasting equipment is forecast to remain stable at around $15 million a year. Products with very high potential for the next 5 years include telephone and telex equipment, fiber optics cables, data communications equipment, and paging systems.

Table 1.—Singapore: The market for telecommunications equipment, 1979, 1980, and projected 1986

(in millions of U.S. dollars)

	1979	1980	Projected 1986
Telephone and telex equipment			
Local production	18.71	27.33	57.4
Imports	31.87	36.61	76.9
Exports (less)	10.98	16.23	34.1
Total	39.60	47.71	100.2
Transmission equipment			
Local production	5.76	6.64	17.9
Imports	20.07	26.83	72.5
Exports (less)	6.66	9.16	24.7
Total	19.17	24.31	65.7
Mobile radio			
Local production	.69	.38	.8
Imports	13.88	16.23	35.4
Exports (less)	3.97	3.92	8.6
Total	10.60	12.69	27.6
Video and radio broadcast equipment			
Local production	7.17	10.27	10.3
Imports	18.13	36.90	36.9
Exports (less)	10.45	31.52	31.5
Total	14.85	15.65	15.7
Data communications equipment			
Local production	44	2.67	6.0
Imports	5.15	3.82	8.6
Exports (less)	.49	.65	1.5
Total	5.10	5.84	13.1
Total market			
Local production	32.77	47.29	92.4
Imports	89.10	120.39	230.3
Exports (less)	32.55	61.48	100.4
Total	89.32	106.20	222.3

Source: Singapore Trade Statistics (Imports), 1979 to 1980 and Singapore Trade Statistics (Exports), 1979 to 1980, Department of Statistics, Singapore and "Brief Study on Market for Communications Equipment and Systems in Singapore," prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box).

Competitive Environment

More than 85 percent of the telecommunications equipment market is satisfied by imports, which are projected to top $230 million in 1986. Japanese companies led the import market with 57 percent of sales in 1980, followed by U.S. firms with 14 percent (see table 2). Manufacturers from Belgium and Luxbourg, the United Kingdom, Korea, France, and Sweden accounted for most of the rest of the foreign shipments.

Japanese suppliers do best what Singapore end users value most: provide good backup service (especially after the guarantee period), offer advantageous credit terms, and provide spare parts readily and immediately. Japanese vendors also offer competitive prices for their products, though price is not as important to Singapore customers as fulfilling specifications.

U.S. firms could improve their competitive positions by paying closer attention to specifications, backup service, spare parts, quick response to tenders, and staff training and supervision. Government organizations such as the Telecommunications Authority of Singapore (Telecoms) should not be treated as commercial organizations, but expect special credit terms. These failings more than offset any technological advantages American products bring to the market, except in mobile radios and test and measurement equipment where the margin of technological superiority is so great that U.S. companies dominate.

Domestic manufacturers are oriented toward the export market, with less than 15 percent of their products sold locally. These companies, most of which are foreign owned, produce largely office telephone equipment, such as private automatic branch exchanges (PABX's) and key telephone sets, cables and wire, and radio telephones. Though the quality of their products is relatively high—due to access to advanced technology which foreign ownership affords—local firms prefer to market outside Sin-

Source: "Brief Study on Market for Communications Equipment and Systems in Singapore," Applied Research Corporation, 303, Tanglin Road, Singapore 10, Republic of Singapore, May 1982, prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box).

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[1] All values are shown in U.S. dollars; local currency data are converted at the following exchange rates: US$=$2.17 (1979) and $2.14 (1980). Values for the years through 1980 are expressed in current rather than constant dollars; values for 1981 and subsequent years are expressed in 1980 constant dollars.

Table 2.—Singapore: Imports of telecommunications equipment by country of origin, 1980 and projected 1986

(in thousands of U.S. dollars)

	1980	Projected 1986
Telephone and telex equipment		
United States	2,189	3,845
Japan	16,850	
Belgium and Luxembourg	8,820	
France	1,755	
Sweden	1,626	
Other	5,374	
Total	36,614	76,922
Transmission equipment		
United States	3,091	5,796
Japan	17,599	
Korea	2,146	
United Kingdom	1,123	
Italy	608	
Other	2,267	
Total	26,834	72,464
Mobile radio		
United States	6,418	10,625
Japan	3,214	
United Kingdom	3,608	
Canada	546	
France	495	
Other	1,947	
Total	16,228	35,416
Video and radio broadcast equipment		
United States	2,957	2,765
Japan	30,104	
United Kingdom	971	
Taiwan	304	
Korea	298	
Other	2,261	
Total	36,895	36,895
Data communications equipment		
United States	1,790	3,458
Japan	704	
United Kingdom	593	
Germany	116	
Denmark	191	
Other	430	
Total	3,824	8,644

Source: Foreign Trade Statistics (Imports), 1980, Department of Statistics, Singapore and "Brief Study on Market for Communications Equipment and Systems in Singapore," prepared under contract to the International Trade Administration, Office of Trade Information Services.

gapore, which they consider intensely competitive. This preference is not expected to change as long as the Government maintains its open-tender policy.

Table 3.—Singapore: Sales of telecommunications equipment by product category, 1980 and projected 1986

(in thousands of U.S. dollars)

	1980	Projected 1986
Telephone and telex equipment		
Switches and switching systems	23,972	64,953
Subscriber/user premises equipment	10,561	12,196
Other telephone and central office equipment	8,505	9,533
Telex	4,672	13,551
Category total	47,710	100,233
Transmission equipment		
Wire and cable	23,752	43,460
High-frequency radio	561	21,028
Microwave	2,336	1,168
Lightwave	—	—
Category total	26,649	65,656
Mobile radio		
Land (hf, vhf, uhf)	6,072	9,255
Marine (hf, vhf)	776	3,019
Paging systems	4,112	15,420
Air-ground communications	1,730	—
Category total	12,690	27,694
Video and radio broadcasting equipment		
Closed circuit television	1,308	1,308
Radio broadcast transmitters	1,636	1,636
Television broadcast transmitters	2,430	2,430
Antenna towers	3,271	3,271
Radio studio equipment	2,799	2,799
Video studio equipment	4,198	4,198
Category total	15,642	15,642

Source: "Brief Study on Market for Communications Equipment and Systems in Singapore," prepared under contract to the International Trade Administration, Office of Trade Information Services.

Product Market Profiles

Telephone and telex equipment.—With increasing demand in the public and commercial sectors, sales of telephone and telex equipment are expected to grow from $48 million in 1980 to $100 million in 1986 (see table 3). Foreign manufacturers should maintain their approximately three-quarters share of the market during the next few years. However, U.S. firms accounted for only 6 percent of imports in 1980 and, even with a rapidly growing market, are not expected to increase their share.

Plans for expansion of telephone lines and exchanges and the introduction of telemetering services (to be operated through telephone networks) and teleconferencing should boost sales of switches and switching equipment from $24 million in 1980 to $65 million in 1986. Prospects for subscriber/user premises equipment and other telephone and central office equipment are not as bright, however, with only modest growth forecast. The main supplier of subscriber telephone equipment in 1980/81 was Nippon Electric Company (NEC) of Japan. Other foreign firms selling PABX, key telephone systems, and executive/secretary telephone systems include the German subsidiary of International Telephone and Telegraph (ITT), Philips from the Netherlands, and the British company General Electric Corporation (GEC).

Several local manufacturers compete in this market. Setelco Electronics Co., a German-owned firm, sells 15-20 percent of its products domestically, including its executive/secretary office telephone equipment. Semi-Con Industries also manufactures office telephones and accessories.

Foreign vendors should find the greatest opportunities for sales in telex equipment, which are forecast to grow from $5 million in 1980 to $14 million by 1986. To meet increasing demand for telex machines, subscriber lines for telex exchanges are also being expanded. Telecoms, which rents out all telex equipment, is upgrading service by introducing a higher standard model—a teleprinter machine using electronic send-and-receive principles. The Japanese firm OKI enjoys a near monopoly of the market, with a 90-95 percent share. NEC, the French firm Sagem, and the American manufacturer Extel, also supply telex equipment.

The demand for facsimile equipment, which until recently came largely from multinational corporations with branches in Singapore, should receive an extra boost from Telecoms. In order to make facsimile service more available to the population, it merged with the Singapore Postal Services in late 1982 and is in the process of installing facsimile machines in each of the 73 post offices.

Transmission equipment.—With several submarine cable projects on the drawing board and the expansion of telephone networks proceeding apace, sales of transmission equipment are projected to rise from $27 million in 1980 to $66 million in 1986. The market for wire and cable is forecast to increase from $24 million in 1980 to $43 million in 1986. Though U.S. firms are the second leading foreign suppliers, they were still able to garner only 13 percent of the market in 1980, as Japanese vendors dominated sales.

In addition to the current $70 million submarine cable linking Singapore, Malaysia, and Thailand, due for completion in 1983, three other submarine cable projects will be undertaken during the next few years: a $40 million project linking Medan and Singapore; a $140 million cable link between Singapore and another Asian country, and a $1.4 million-1.9 million inland cable link between Tuas and Comcentre. Japanese firms NEC and Fujitsu and Standard Telephones and Cables of the United Kingdom have supplied submarine cables in the past. local companies play a relatively strong role in the telephone cable market. Sigma Cable Co. (Pte) Ltd., a Singapore-Taiwanese joint venture, supplies 25-30 percent of the market. Foreign manufacturers, such as BICC Telecommunications Cables of the United Kingdom, General Cables from the United States, Japanese firms Sumitomo and Furukawa, and Gold Star from Korea, supply the remainder of the market.

Demand for high-frequency (hf) radios is largely dependent on the spending plans of the Ministry of Defense, the main consumer. With the construction of a hf coast station, sales are expected to mushroom from a mere $561,000 in 1980 to $21 million in 1986. The Ministry of Defense has, in the past, turned to the British firm Racal for hf radios. Telecoms is also expected to make small purchases for ship/shore transmission.

For multiplexers, both 24-channel and 30-channel pulse code modulation (PCM) is used, though future expansion will be done only through 30-channel PCM networks.

Microwave transmission is only used for offshore telephone service and for transmission to Malaysia. The relatively small market for microwave equipment is expected to decrease even further over the next few years. Another new technology, fiber optics, is not even used in Singapore, though there are plans to incorporate optical fibers in the Tuas-Comcentre cable link.

Mobile radio.—Except for air-ground communications equipment, a strong market exists for mobile radios, as purchases from a wide variety of end users—the Ministry of Defense, Police Department, Telecoms, the Port of Singapore Authority (PSA), the taxi associations, and Singapore Airlines—are expected to increase dramatically. The most promising growth area should be paging systems: sales are forecast to climb from $4 million in 1980 to $15 million in 1986. Radio pagers are in greatest demand, with 9,967 radio pagers rented out by Telecoms in 1981, a 60-percent increase over the previous year.

Though only $776,000 worth of marine mobile radios was bought in 1980, sales are expected to reach $3 million in 1986, as the number of subscribers rises from the 62 who currently operate 95 sets. Land mobile radios, with 341 subscribers, should also come into greater use, pushing sales to the $9 million mark by 1986, a $3 million increase over 1980. Different networks are used by the Ministry of Defense and the Police Department, which employ large numbers of walkie talkies; some 2,000 were in operation in 1980.

U.S. manufacturers captured 40 percent of the mobile radio market in 1980. Sales by companies such as GEC and Motorola have been buoyed by the high esteem in which U.S. mobile radio technology is held. However, the competitive pricing and effective sales techniques of Japanese firms such as NEC, Matsushita, and National are threatening the U.S. market share. Other third-country suppliers include Multitone and Marconi from the United Kingdom and SRA from Sweden. Caltron (Pte) Ltd., a local company owned by Singapore interests, is the main supplier of radio telephones for the taxi associations.

Video and radio broadcasting equipment.—Sales of video and radio broadcasting equipment have stabilized at $15.6 million a year, and no increases are expected in the near future. Video broadcasting equipment accounts for 42 percent of the market, and radio broadcasting equipment, 28 percent. Closed circuit TV (CCTV) makes up 8 percent and is used by the Singapore Broadcasting Corporation (SBC) only for things like subtitles. However, the Port of Singapore and the Department of Civil Aviation employ CCTV at airports.

The needs of the SBC, which buys 80 percent of this equipment, were largely satisfied by purchases it made when it became a statutory board. SBC will have to purchase replacements, but since its equipment is relatively new and durable, such occurrences should be infrequent. When it does enter the market, SBC is known to select sellers on the basis of specifications and price, criteria which strongly favor Japanese companies and have helped make them SBC's main suppliers. However, SBC refuses to buy on a turnkey basis, so many different brands are in use.

Data communications equipment.—Computerization is just beginning to have an impact in Singapore, thus significant demand for data communications equipment is still a few years away. Telecoms leases 220 lines for modems, excluding lines used by the Ministry of Defense. Individual companies purchase the modems themselves. The Post Office Savings Bank (POSB), the largest modem user, has about 230; Singapore Airlines has about 100. Other end users include banks and multinational companies. Expenditures were estimated at $4-6 million in 1980, including concentrators and multiplexers for international links, and are forecast to double by 1986 to $8-12 million. Purchases should pick up as government organizations and the larger local firms start to use data communications. End-users are expected to favor American products, because of their superior technology.

Test and measurement equipment.—The market for telecommunications test and measurement equipment reached $6 million in 1980 and is forecast to more than double by 1986. As the market matures, the mix of products most in demand will shift toward more digital technology. The popular items now are synthesizers, telephone test sets, vhf test sets, frequency meters, modulation meters, and transmitter testers. By mid-decade, greater interest should develop for products such as 600-MHz digital storage oscilloscopes, digital multifunctional meters, and computer controllable data acquisition systems. Shoppers should also be looking for signal-generating equipment, data link analyzers, antenna pattern measuring equipment, and communications monitors.

Some test and measurement equipment is acquired as part of turnkey projects, although many users find it less costly to buy the equipment separately. End-users relied on U.S. suppliers for 47 percent of their purchases in 1980, but there has been some dissatisfaction with late deliveries. Major suppliers to date have been Hewlett Packard and Spectron (United States); Racal, Marconi, and Plessy (United Kingdom); Anritsu (Japan); Philips; and some local manufacturers.

Satellite transmission equipment.—With the implementation of current Telecoms plans, satellite communications will become an important segment of Singapore's telecommunications service. As a member of the International Maritime Satellite Organization (INMARSAT) and the International Telecommunication Satellite Organization (INTELSAT), Telecoms is bringing Singapore into the satellite age. It has been preparing for INMARSAT's first series of satellites by constructing a $5.6 million coastal earth station to operate into the Pacific Ocean Region. It is also planning to increase telephone circuits in satellite from 490 to 1,200. In addition, Telecoms intends to build an antenna in 1982/83 in order to gain access to Indonesia's Palapa Satellite System. While it is also considering the construction of a heavy route station in 1985, no actual plans have been confirmed.

Table 4.—Singapore: Purchases of telecommunications equipment by major end-user sectors, 1980 and projected 1986

(in thousands of U.S. dollars)

	1980	Projected 1986
Telecommunication Authority of Singapore	94,860	190,794
Singapore Broadcasting Corporation	8,879	7,009
Singapore Armed Forces	3,738	5,607
Singapore Police Force	327	654
Meteorological Department	794	1,869
The Port of Singapore Authority	1,495	1,682
Changi Airport	5,607	5,607
Singapore General Hospital	1,294	467
Singapore Airlines	4,673	4,673
NTUC Taxis	561	561
Total purchases	122,228	218,923

Source: "Brief Study on Market for Communications Equipment and Systems in Singapore," prepared under contract to the International Trade Administration, Office of Trade Information Services.

End-User Profiles

Most decisions that affect telecommunications in Singapore are made by Telecoms, a 10,280 person-strong government organization that is involved in every sphere of the market. About 75-80 percent of communications equipment is purchased by Telecoms (see table 4). The remainder of the market is divided among nine main buyers, including SBC, Changi Airport, Singapore Airlines, and the Armed Forces, who have specialized needs and make most of their purchases from a narrow range of communications products. But even in these, Telecoms has a large voice in selecting the equipment.

Telecoms.—All technical standards and requirements for communications equipment and systems are stipulated by Telecoms. Buyers in both the public and private sectors are required by law to seek approval from Telecoms before any equipment can be installed, attached, or used. By virtue of its pervasive authority and wide-ranging responsibilities, Telecoms largely determines the size of the market and the level of demand for specific products. Its funding sources are shown in table 5.

Upgrading telephone service is a major objective of current economic plans. In 1979, the Government launched the "Pushbutton Telephones for All" campaign to replace rotary-dial telephones. Already more than halfway toward its goal, the Government plans to replace the remaining 185,000 rotary dial telephones in 1983. Also on the rise has been the number of public telephones, which amounted to 13,659 in 1980 (see table 6). Most are outdoor public telephones (pay phones), but public telephones rented to private concerns such as shops, factories, and hotels, which then keep the money deposited (coinafons) are also popular; agency phones constitute less than 10 percent of total public telephones.

Singapore's telephone density, 30 per 100 persons, is one of the highest in the Asian region. More than 25 percent of the 573,000 telephone subscribers are served by electronic exchanges. The country boasted 1,991 PABX's and 4,769 PBX's in 1980. The number of key telephone systems increased to 2,300 in 1980 from 1,432 the previous year. Singapore's international telex service reaches 196 destinations, of which 141 are fully automatic.

Table 5—Singapore: Distribution of telecommunications funding, as of March 1981

(in thousands of U.S. dollars)

Revenue from international telephone	87.8
Revenue from international telex	62.0
Revenue from international telegram	6.2
Revenue from international leased circuits	9.6
Revenue from rentals	74.2
Net surplus	123.6
Capital expenditures	102.8
Shareholder's funds	586.1

Source: "Brief Study on Market for Communications Equipment and Systems in Singapore," prepared under contract to the International Trade Administration, Office of Trade Information Services.

Table 6.—Singapore: Statistics of national telecommunications system, 1981

Telephone exchanges	22
Lines	700,000
Business subscribers	151,000
Residence subscribers	422,000
On waiting list	3,000
Telex subscribers	9,008
On waiting list	22
Telephone stations	769,000
International telephone calls	3,850,760
International telex calls	7,839,224
Types of public telephones	
Pay phones	7,526
Coinafons	5,591
Agency phones	542
Total	13,659

Source: "Brief Study on Market for Communications Equipment and Systems in Singapore," prepared under contract to the International Trade Administration, Office of Trade Information Services.

Radio and TV broadcasting.—In February 1980, SBC (formerly Radio Television Singapore or RTS) became a statutory body. It operates five FM stations, four AM stations, and two vhf TV channels.

In addition, Rediffusion (S) Pte Ltd. runs a privately owned radio company.

Currently, SBC's radio broadcasting equipment includes 40 consoles, both portable and fixed; 150-200 tape recorders; 180 microphones; and four speakers in each large studio. Its video broadcasting equipment comprises seven consoles, 30 video tape recorders, and one television standard converter. The single antenna tower in Singapore, situated in Bukit Batok, is used for both TV and radio.

Others.—The airline sector, which has many uses for communications equipment, has emerged as a significant buyer. The new Changi Airport, government-owned and -operated (by the Department of Civil Aviation), makes slightly greater purchases than the private Singapore Airlines. This sector has particular use for modems and air-ground communications. The next biggest buyer, the Ministry of Defense, is the main user of hf radio equipment, and also employs mobile radios—including walkie-talkies—and air-ground communications.

Marketing Practices

Public sector organizations buy most of their equipment through tenders. Small tenders may be available to only local companies, but tenders that exceed $450,000 are open to all foreign bidders,

Leading Suppliers

Name	Country(ies) of manufacture	Type of equipment
Telephone and telex equipment		
Ericsson Group	Singapore	Telephone switches; power supplies for remote switching and transmission stations
Nippon Electric	Japan	Facsimile equipment
Philips	Netherlands	Telex equipment
Siemens	Germany	Telex equipment
Trasmission equipment		
Ericsson/Sieverts Kabelwerk	Singapore	Cable, wire
ITT/IKO Kabelfabrik	Singapore	Cable
ITT/Standard Radio	Sweden	Transmission multiplexers
Mobile radio equipment		
Motorola	United States	Closed network systems
Ericsson/Svenska Radio AB/SONAB	Sweden	Mobile telephones Paging equipment
GE/STORNO	Denmark	Closed network systems
Hasler	Switzerland	Paging equipment
Multitone	United Kingdom	Paging equipment
NOKIA	Finland	Mobile radio equipment
Pye	United Kingdom	Mobile radio equipment
Video and radio broadcasting equipment		
WIBE	Sweden	Antenna towers
KathreineGermany	Radio and TV antennas	
Philips	Netherlands	Fixed cameras
Pye	United Kingdom	Transmitters/radio & TV
Rank	United Kingdom	Film scanners
Rhode und Schwartz	Germany	Radio and TV antennas
Data communications equipment		
Codex	United States	High-speed modems
Datasaab	Sweden	Miscellaneous data communications equipment
Ericsson	Sweden	Switching equipment; modems; multiplexers
ITT/Standard Radio	Sweden	Modems; multiplexers
Magnetic	Sweden	Miscellaneous data communications equipment
Elektrisk Byra	Norway	Concentrators
NOKIA	Finland	Modems
Philips	Netherlands	Miscellaneous data communications equipment
RACAL	United Kingdom	High-speed modems
Siemens	Germany	Miscellaneous data communications equipment
Communications test equipment		
Hewlett Packard	United States	Automatic test equipment
Simpson	United States	Digital multimeters
Tektronix	United States	Oscilloscopes
Bruel & Kjaer	Denmark	Measurement equipment
Philips	Netherlands	Oscillators, panel meters
Rhode & Schwartz	Germany	I.C. testers, microwave test equipment
Siemens	Germany	Meters; calibrators
Services		
AB Teleplan	Sweden	Consulting
ELLEMTEL	Sweden	System design
SWEDTEL	Sweden	Consulting

even those with no local representation. In the bidding process, the branch office or distributor merely acts as liaison between purchaser and supplier.

Government purchasers are guided in equipment selection by brochures from suppliers and information in such publications as Communications International or Telecommunications. The final decision is influenced primarily by quality of backup service, availability of training and supervision of staff, and ability to provide spare parts readily. Good credit terms to finance the purchase. Government bodies do not seek credit from the major international banks and organizations, and they place great stock in obtaining favorable credit terms from the supplying company.

Trade Restrictions

Other than the need to obtain special licenses for certain telecommunications equipment (for example, mobile radio), foreign trade in communications equipment is free of any impediments, including custom duties, domestic taxes or levies, or foreign exchange restrictions.

Singapore: Basic Economic Indicators

Population:	2.5 million (1982)	Major trading partners:	Malaysia, United States, Japan, Hong Kong, Thailand, Germany, Australia, Indonesia, Saudi Arabia
Area:	618 sq. km.		
GDP:			
Contributions to GDP:			
GDP:	$10.5 billion (1981)	Exchange rate:	2.14 Singapore $⅓US$1 (1980)
Contributions to GDP:	Services 62% (1980)	Fiscal year:	April 1—March 31
	Industry 37%	Current account balance:	-$1,577 million (1980)
	Agriculture 1%	International reserves:	$6,567 million (1980)
Per capita income:	$4,340 (1980)	Federal budget	
Inflation rate:	5.1% (1980)	revenues:	$3.1 billion (1980-81)
Exports f.o.b.:	$19.4 billion (1980)	expenditures:	$2.9 billion (1980-81)
U.S. share:	12.7% (1980)	Labor force:	1.1 million (1981)
Imports c.i.f.:	$24.0 billion (1980)	Unemployment:	3.9% (1981)
U.S. share:	14.1% (1980)	Average hourly wage:	$1.24 (1980)

Useful Addresses

Embassies:

American Embassy
Commercial Section
30 Hill Street
Singapore 0617
tf: 330 0251

Embassy of the Republic of Singapore
1824 R Street, N.W.
Washington, DC 20009
tf: 667 7555

Leased lines and data communications

Telecommunications Authority of Singapore
Business Telecommunications Department
Comcentre Telecoms HQ
31, Exeter Road
Singapore 0923

Telecommunications administration/PTT:

The Telecomunication Authority of Singapore
Comcentre Telecoms HQ
31, Exeter Road
Singapore 0923
Attn: General Manager
tf: 734 3344
tg: telecom Singapore
tx: telecom rs21246
tf: 734 3344
tx: 33311

Radio broadcasting:

Singapore Broadcasting Corporation
Ministry of Culture
Maxwell Road
P.O. Box 1902
Singapore 9038
Attn: Chairman
tf: 256 0401
tg: broadcast singapore
tx: rs24156

Television broadcasting:

Television Singapore
Ministry of Culture
Maxwell Road
P.O. Box 1902
Singapore 9038
Attn: Director of Broadcasting
tf: 256 0401

Technical standards:

Singapore Institute of Standards and Industrial Research (SISIR)
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Country Market Survey

ELECTRIC POWER SYSTEMS

Indonesia

U.S. DEPARTMENT OF COMMERCE
International Trade Administration

Indonesia

CMS/EPS/560/83, November 1983

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AT URBANA-CHAMPAIGN

Indonesia's capital expenditures for electric power systems is expeted to increase an average 15 percent annually during 1982-87, reaching $6.62 billion,[1] fueled by major Government development projects in energy and heavy industry (see table 1). To meet an expected rapid growth in electricity demand, Perusahaan Umum Listrik Negara (PLN), the State-owned utility, plans to almost double its generating capacity between 1981 and 1987. Process industries, unable to obtain sufficient electricity from PLN, have built their own power plants and are forecast to make significant purchases of power plant equipment.

Coal-fired steam plants and hydropower stations will dominate new construction to capitalize on the country's abundant non-oil energy resources. Emergence of the energy conservation equipment market has been held back by the soon-to-be-removed Government subsidy on diesel fuel. Dispersed, on-site power plants dominate the country's electricity supply system, limiting demand for transmission and distribution equipment. Generation equipment accounts for nearly the entire market.

Absence of local manufacturers, engineers, and service firms capable of working on major power plant projects has opened the entire market to imports, valued at $142 million in 1980. U.S. firms, recognized for superior design and engineering of electrical systems, provided 14 percent of Indonesia's imports of electric power equipment in 1980, but are handicapped by Japanese suppliers' ability to underprice equipment of similar quality and reliability. To increase their presence in this market, U.S. suppliers should retain the services of an aggressive local agent and participate in joint ventures with local manufacturers and engineers.

Energy Resources and Use

Indonesia has plentiful untapped reserves to supply its electricity generation needs. Until recently, 90 percent of domestic energy consumption was oil-based, but the Government's focus is shifting to coal and natural gas, both critical elements in the country's fuel substitution strategy. Production contracts were recently awarded to ARCO (United States) and two other companies to mine the coal reserves on Kalimantan. Coal from the Bukit Asam mine in South Sumatra will fuel a 2,500 mW plant by 1993. Indonesia is a large exporter of crude oil, coal, and LNG; its energy exports exceeded $16 billion in 1980.

Renewable resources are significant in the country's energy profile: in 1980, hydroelectric power potential amounted to 30,000 mW, and geothermal energy reached 8,500 mW. A trial geothermal plant was dedicated in 1978 at Kamojang, West Java, and PLN plans to build another plant. Solar energy has not yet been tapped as a power source.

Table 1.—Indonesia: Capital expenditures by electric utilities, FY1980, 1982, 1987, and 1992

(in millions of U.S. dollars)

	1980	1982	1987	1992
Generation				
Fossil	547	1,025	2,040	4,830
Nuclear	—	—	—	—
Hydro	1,052	1,267	2,523	5,971
Pumped storage	—	—	—	—
Gas turbine	—	—	—	—
Internal combustion	837	201	410	950
Geothermal	35	81	160	380
Solar	—	—	—	—
Total	2,471	2,574	5,133	12,131
Transmission and distribution	720	746	1,485	3,520
Miscellaneous	—	—	—	—
Total	3,191	3,320	6,618	15,651

Source: National Development Planning Board and International Trade Administration, Office of Trade Information Services research report, The Market for Electric Power Systems —Indonesia (see Additional Information box).

Per capita energy consumption, estimated at 187 kilos of coal equivalent or 38.5 kWh in 1980, is projected to increase 7.3 percent per year through 1995. Households account for 45 percent of PLN's power sales. Homes and businesses in Java consume about 80 percent of electricity produced. PLN operates individual power plants not connected to an island-wide grid system, except in Java, which has the population density required for a grid.

The degree of electrification varies by region: approximately 10 percent of Java's households have access to electric power, compared to about 6 percent countrywide. Electricity is supplied to some rural areas by small diesel or hydropower facilities owned by PLN. Others receive surplus power from nearby industrial process plants, although per capita installed capacity in areas such as Bali and East and West Nusa Tenggara is still low.

Electric Power System Market

Indonesia has embarked on a program to promote industries that convert raw materials to processed goods. Many of these are energy-intensive, such as the forest products, minerals, petrochemicals, sugar, oil refining, and cement industries. The Government has also undertaken an ambitious rural electrification program. The private sector anticipates making substantial purchases in the 1981-86 period, particularly to supply electricity to industrial process plants and to obtain baseload and peakload power in areas where PLN service is unavailable or unreliable.

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rate: US$1=625 Rupiah (1978-81). Values for 1981 and subsequent years are given in 1981 constant dollars.

Imports fill the demand for large-scale, high-voltage, or high-technology equipment, all presently beyond the capabilities of domestic manufacturers. Firms in the United States, Japan, Germany, France, and the Netherlands furnish approximately 80 percent of the electric power equipment imported. Their strength in the market is attributed to the influence their Governments have, as major financial backers of energy projects, in the selection of equipment for power systems. For example, Japan provided government loans to Toyo Engineering, the firm selected to design, supply, and build the Asean Aceh Fertilizer plant; Toyo was allowed to select Japanese suppliers for a majority of the plant's process equipment. The recognized superiority of U.S. firms in electrical systems design and equipment enabled General Electric and Solar Turbines to overcome the pro-Japanese bias on the Asean Aceh project and win the electrical contract, worth $19.5 million out of the total project equipment cost of $260 million.

Domestic suppliers.—Indonesia has no integrated manufacturer with the capability to produce electrical equipment from base material to final product. Domestic manufacturers restrict their activities to assembly of imported components and production of low and medium voltage equipment, such as diesel engines up to 500 horsepower and generators up to 125 KVA. Local firms are active in the assembly of panels and switchboards, transformers, power and disconnecting switches, and diesel engines. They sell their products primarily to buyers in the residential and commercial sectors, who are least sensitive to product reliability.

The five diesel engine assemblers registered in Indonesia have a combined production capacity of 75,000 units per year. All are affiliated with Japanese or German firms in joint ventures or have purchased licenses from these firms. Four of the 20 companies registered to produce electrical panels and switchboards also have foreign partners or licensors. Since local manufacturers are accorded preferential treatment in public sector contracts, U.S. suppliers could increase their competitiveness by establishing such joint ventures.

U.S. suppliers.—U.S. firms supplied 22 percent of generation equipment imports and 9 percent of transmission and distribution equipment imports in 1980 (table 2). Buyers consider U.S. equipment, particularly for generating sets and electrical systems, to be highly reliable. This reputation for excellence should help U.S. suppliers of high-capacity equipment overcome their price disadvantage with Japanese manufacturers. Caterpillar generators are

Table 2.—Indonesia: Imports of electric power systems, 1975-80

(in millions of U.S. dollars)

	1975	1976	1977	1978	1979	1980
Generation equipment						
United States	18.6	20.3	3.9	13.8	22.4	13.7
Japan	25.0	14.6	15.2	13.3	14.2	15.3
Germany	40.9	27.2	21.1	19.6	17.3	18.6
Netherlands	6.2	12.9	76.1	17.0	3.0	1.5
All others	23.4	11.2	7.0	10.4	19.1	14.3
Total	114.1	86.2	123.3	74.1	76.0	63.4
Transmission and distribution equipment						
United States	3.5	9.1	7.7	5.2	9.0	6.8
Japan	10.7	19.0	10.8	7.1	6.1	48.6
Germany	6.5	7.0	9.7	3.2	2.6	4.8
Netherlands	.5	1.5	2.9	1.0	.6	1.5
France	3.3	5.5	1.2	9.7	8.6	10.1
United Kingdom	1.3	.3	.2	.6	.9	1.3
All others	5.5	5.0	5.4	5.1	11.6	5.8
Total	31.3	47.4	37.9	31.9	39.4	78.9
Total (combined)						
United States	22.1	29.4	11.6	19.0	31.4	20.5
Japan	35.7	33.6	26.0	20.4	20.3	63.9
Germany	47.4	34.2	30.8	22.8	19.9	23.4
Netherlands	6.7	14.4	79.0	18.0	3.6	3.0
All others	33.5	22.0	13.8	25.8	40.2	31.5
Total	145.4	133.6	161.2	106.0	115.4	142.3

Source: Central Bureau of Statistics.

felt to be the most reliable for generating sets above 500 KVA capacity, with spare parts and backup service easily available.

Third-country suppliers. — Japanese firms dominate in the lower than 150 KVA segment and share the 150 to 500 KVA market with Dutch, German, and American manufacturers. Japanese companies provided 45 percent of all electric power systems equipment imports in 1980, benefiting from their ability to offer prices up to 30 percent lower than U.S. prices, and to shorter delivery lead times. Hitachi, Toshiba, and Nippon Electric are particularly successful in the Indonesian market.

Philips (Netherlands) and Siemens (Germany) have effectively used full-time marketing representatives stationed in Indonesia to maintain contact with potential buyers. Other well-regarded suppliers include AEG, Deutz, MAN (Germany) and Unelec and Telemecanique (France).

Energy Conservation Equipment Market

Indonesia's Government has laid the groundwork for energy conservation by encouraging firms to include efficient equipment in their plants, both as part of the original design and as a retrofit measure. Project design engineers should be the focus of marketing efforts, since they are influential in the selection of equipment. Proposed action by the People's Consultative Assembly to remove the $0.25 per liter subsidy on diesel fuel, coupled with rising fuel prices, is expected to give impetus for a separate market for energy conservation systems. The greatest potential for market expansion is in the industrial sector, and particularly in plants that generate their own power using diesel fuel. Demand may rise for automated energy management systems in the commercial and institutional sectors. Designers of new buildings are becoming more receptive to products such as window covers and sunscreens.

Consulting firms are likely to experience limited sales until energy conservation becomes a pressing need in the eyes of manufacturers and the business community, at which time, opportunities to conduct energy audits and develop conservation programs will emerge. U.S. suppliers should be in a good position to tap this market, since no domestic manufacturers specialize in energy conservation equipment or services. Suppliers of such equipment should focus their marketing efforts on commercial and industrial centers, particularly in Jakarta, Surabaya, Semarang, Bandung, Medan, and Ujung Pandang.

Advisory Services

The lack of local firms qualified to undertake large projects, coupled with PLN's desire for technology transfer, provide outstanding opportunities for U.S. consulting engineer and technical advisory firms. PLN uses consulting engineers for the most complex elements of its projects, including feasibility studies, technical design, procurement, construction, and commissioning. PLN's staff undertakes the basic tasks of route and topography surveys and civil works for plant buildings.

Thirty firms from 14 countries are providing services on PLN projects, including Chas. T. Main, which is the project manager and design and construction consultant on the rural electrification project. The choice of consulting engineers is based primarily on qualifications and track record in similar projects. U.S. consulting firms could improve their access to potential clients by maintaining contacts with one or more of the 15 local engineering firms currently involved in power projects.

End-User Sectors

Government agencies provided 56 percent of the installed generating capacity in 1979. This share is projected to increase to 75 percent in 1986/87, as the public utility makes massive investments to meet the country's power requirements. The industrial and commercial sectors will continue to be large purchasers due to their need for electricity in areas not supplied through the grid system.

Electric utilities.—The PLN is responsible for the generation, transmission, and distribution of electricity in Indonesia. It also ensures that generating facilities built by the private sector are designed, constructed, and operated according to specifications.

PLN plans to increase its generating capacity from 2,742 mW in 1981 to 5,221 mW in 1987, striving to meet a projected 25 percent per year increase in demand for electricity. PLN operates about 3,800 km of transmission lines at 70 and 150 kV, and 40,000 km of distribution lines, concentrated in Java.

PLN's plans, reviewed by the Department of Mines and the Central Planning Board (BAPPENAS) and incorporated in the Government's 5-year development plan (REPELITA III) provide for a change in its generating mix, heavily weighted to oil, by investing in coal and natural gas fired plants and hydro power (table 3). The PLL's current heavy reliance on diesel generators resulted from its need to rapidly add generating capacity in the late 1970s. Three steam plants providing 1,200 mW of capacity, and 14 hydropower plants with a capacity of 1,297 mW are under construction to decrease that reliance. In addition, PLN has proposed, 1,200 mW of steam generation, 1,680 mW of hydropower, and 65 mW of geothermal power. Major prospective projects include: Gresik Steam Power Plant Units 3 and 4 (2 × 200 mW); Jatigede Hydropower plant in

West Java (2 × 200 mW); Cirata Hydropower plant, also in West Java (500 mW); and Surabaya 3 and 4 coal-fired plants (2 × 400 mW). All other projects identified by PLN would provide capacity additions of less than 100 mW each. Proposals for additional diesel capacity, totaling 235 mW at dozens of scattered sites, are being made to provide power to rural areas.

Annual capital expenditures are projected to double from current levels by 1987 and more than double in the following 5 years, reaching almost $16 billion in 1992. As shown in table 1, generating equipment is expected to average more than 75 percent of expenditures in each year. PLN is forecast to spend most of its capital budget on hydropower generating equipment.

Other power authorities.—Rural cooperatives are being formed to operate and manage some of the stations built under REPELITA III's rural electrification program. This program, expected to receive loan and grant assistance from the United States, Canada, and the Asian Development Bank, is supposed to provide 178 mW of capacity to 648 villages in Java, Sulawesi, and Nusa Tengga Barat by 1984.

Private sector.—Industrial process plants generate electricity to meet their needs, and under PLN's directive, supply excess power to neighboring villages. Commercial and institutional users supplement PLN power with standby generators. During 1977-81 the private sector's installed generating capacity grew at 13.5 percent per year, reaching 2,132 mW in 1981, only slightly lower than PLN's.

The major industrial users of electric power, many of which have built their own power plants, are the petrochemical, cement, mineral processing, steel manufacturing, and textile industries. For example, the Asahan Aluminum Smelter is scheduled to reach a total capacity of 604 mW of hydropower, the Krakatau Steel Complex in Java has a 400-mW diesel plant, and the Central Sulawesi Nickel Smelter has a 165-mW hydroelectric plant. Several plants have announced expansion plans, including the Asean Aceh Fertilizer project, adding 18 mW of diesel power, two Pertamina refineries adding 110 mW of diesel generating capacity, and a 60-mW diesel expansion of Pertamina's Bontang LNG plant.

The Government's promotion of process industries, and the known large-scale expansion plans in the cement industry (projected to add 8.6 million tons of manufacturing capacity by 1985), minerals industry (including the Bintan Alumina plant), and steel industry (expansion of Krakatau Steel) indicate substantial opportunities for suppliers in touch with plant owners' plans.

Market Access

Marketing practices.—Most overseas items are procured through public tenders issued in Jakarta. However, suppliers should not wait for a tender to begin marketing their product. Efforts should be directed at the implementing agency for a project, project engineers, and decisionmakers in countries supplying loan and grant funds.

The most effective way to sell in Indonesia is to retain the services of an aggressive agent. The agent can establish and maintain contacts, and in the case of "technical goods" agents, provide staff engineers and aftersales service. The Government is increasingly requiring State agencies to deal through local agents when purchasing imported goods and services.

Trade representative offices also aid a supplier's marketing effort, although each firm is allowed only one office in the country, and that office may not engage in direct sales. Many foreign firms team their local offices with Indonesian national importers so

Table 3.—Indonesia: Generating capacity of electric utility(PLN) 1977-84, 1986, and 1991

(in megawatts)

	1977	1978	1979	1980	1981	1982	1983	1984	1986	1991
Planned										
Hydro	358.78	402.28	445.03	512.03	557.03	762.03	1,007.03	1,007.03		
Steam	450.00	650.00	1,075.00	2,080.00	2,690.00	3,045.00	3,245.00	3,245.00		
Diesel	377.10	557.90	633.70	646.10	706.10	736.10	766.10	796.10		
Gas	562.66	857.66	857.66	857.66	857.66	857.66	857.66	857.66		
Geothermal	—	—	—	20.00	30.00	40.00	50.00	60.00		
Total	1,784.54	2,467.84	3,011.39	4,115.79	4,840.79	5,440.79	5,925.79	5,965.79	8,000	16,000
Actual installed										
PLN	1,376.00	1,870.00	2,282.00	2,535.00	2,742.00					
Non-PLN	1,290.00	1,688.00	1,779.00	2,132.00	NA					
Total	2,666.00	3,558.00	4,061.00	4,667.00						

Source: PLN, National Committee for World Energy Conference, 1977, and Presidential State Address, 1981.

that the two operate as one, with the local company acting as importer and the foreign supplier promoting the product and providing technical assistance.

U.S. suppliers are advised to appoint distributors in several cities, preferably one company with branches in different market areas, since it is virtually impossible to service the market adequately from Jakarta. Important market and distribution centers besides Jakarta include Surabaya in East Java, and urban centers such as Bandung and Malang in central Java. Sumatra, Sulawesi, and Kalimantan, accounting for 32 percent of the country's population, are supplied from Singapore, Hong Kong, and the Philippines, as well as from Jakarta.

Price and payment terms are the primary criteria in the purchase decision when foreign suppliers have been found to provide products of equal quality and reliability. Payment terms usually provide for a 30- to 40-percent down payment, with the balance up to 6 months after delivery, accruing a 2- to 2.5-percent monthly interest.

Buyers consider delivery lead time an added cost, assuming a 2- to 2.5-percent cost of interest on the letter of credit. Japanese firms have an advantage over European and American firms, whose products take longer to ship. Additional considerations are a firm's reliability, experience, and ability to provide aftersales service.

Advertising is recommended for introducing new equipment. Two Jakarta newspapers, Kompas and Sinar Harapan, reach a significant portion of the business community. The Standard Trade Directory of Indonesia, published by the Indonesian Chamber of Commerce and Industry (J1. Hayam Wuruk 4 SX. P.O. Box 4556, Jakarta) is an excellent advertising medium, as are the government-owned television and radio networks.

Regulations and technical requirements.—Two regulations enacted in 1980 could affect U.S. suppliers. Kepres 10 establishes a procurement guidance team to review all government contracts over $800,000 to ensure compliance with efforts to promote domestic production. Kepres 14A establishes a preferential system of government procurement, giving priority to the purchase of domestic goods and services. Local firms are given preference on contracts of up to $320,000. To obtain contracts below that amount, foreign suppliers must negotiate with the chosen local prime contractor rather than with the project sponsor. Above that amount, foreign suppliers may bid directly.

Electrical equipment is subject to customs duties and a 5- to 10-percent import sales tax. Customs duties are highest on equipment that competes with domestic production. For example, to encourage local assembly operations, the duty on preassembled 0-5 KVA generators is 60 percent, double the duty on the same generator delivered CKD.

No special labels or markings are required. Suppliers are cautioned to provide protective packaging to guard against the hazards of the tropical climate, rough treatment by dock workers, and considerable pilferage at ports.

Additional Information

The project officer responsible for Country Market Surveys on Electric Power Systems is:

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This Survey summarizes a 61-page International Market Research (IMR) report prepared by SGV-UTOMO in Jakarta under contract to the U.S. Department of Commerce, and reflects the opinions and views of interviewees in Indonesia and not those of the Department of Commerce.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

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Indonesia

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Country Market Survey

Telecommunications Equipment

Indonesia

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International Trade Administration

Indonesia's Third Five-Year Development Plan (FY1980-85) includes several public projects to upgrade the country's telecommunications system that should raise the market for equipment and systems from $165 million[1] in 1981 to almost $293 million in 1986 (see table 1). Although most of the telecommunications network needs revamping, the Government is addressing specific areas and moving cautiously in its modernization efforts. The two bulwarks of present-day communications, telephone and television, are receiving the greatest attention, making sales prospects most promising for telephone, telex, and video/radio broadcast equipment.

Competitive Environment

Imports supplied 70 percent of the market in 1978, but this share has been declining with the rise of the local manufacturing industry and is projected to drop to around 50 percent by 1986. Japanese producers dominate the import market, averaging about 40 percent of foreign shipments during 1978-81 (see table 2). Their success is attributed to good prices, effective aftersales service, and favorable credit terms.

U.S. companies increased their sales from 8.5 percent of imports in 1978 to 11 percent in 1981, tak-

Table 1.—Indonesia: The market for telecommunications equipment, 1978-81 and projected 1986

(in thousands of U.S. dollars)

	1978	1979	1980	1981	Projected 1986
Telephone and telex equipment					
Local production	1,726	1,250	1,500	1,800	7,081
Imports	32,377	25,118	23,472	17,767	69,894
Exports (less)	605	140	64	46	181
Total	33,498	26,228	24,908	19,521	76,794
Transmission equipment					
Local production	40,607	45,812	51,016	57,138	114,925
Imports	8,634	7,753	7,261	8,334	9,227
Exports (less)	62	22	61	35	39
Total	49,179	53,543	58,216	65,437	124,113
Video and radio broadcasting equipment					
Local production	2,641	2,398	3,544	15,789	17,621
Imports	46,559	9,131	42,987	42,987	47,977
Exports (less)	1,269	4,079	233	700	781
Total	47,931	37,450	46,298	58,076	64,817
Communications test and measurement equipment					
Local production	—	—	—	—	—
Imports	10,423	16,540	18,908	21,930	26,807
Exports (less)	22	129	5	23	28
Total	10,401	16,411	18,903	21,907	26,779
Total market					
Local production	44,974	49,460	56,060	74,727	139,627
Imports	97,993	88,542	92,628	91,018	153,905
Exports (less)	1,958	4,370	363	804	1,029
Total	141,009	133,632	148,325	164,941	292,503

Source: Foreign Trade Statistical Bulletin (Imports) 1978 to April 1981, Biro Pusat Statistik, Jakarta; Foreign Trade Statistical Bulletin (Exports) 1978 to April 1981, Biro Pusat Statistik, Jakarta; and International Trade Administration, Office of Trade Information Services research study, "Survey of Market for Communications Equipment and Systems in Indonesia" (see Additional Information box).

Source: "Survey of Market for Communications Equipment and Systems in Indonesia," Applied Research Corporation, 303 Tanglin Road, Singapore 10, Republic of Singapore, February 1982 prepared under contract to the International Trade Administration, Office of Trade Information Services (see Additional Information box).

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1=Rp415 (1978), Rp625.25 (1979), Rp627.25 (1980), and Rp633.25 (1981 and subsequent years). Values for years through 1980 are given in current dollars; values for 1981 and subsequent years are given in 1980 constant dollars

Table 2.—Indonesia: Imports of telecommunications equipment by country of origin, 1978-81 and projected 1986

(in millions of U.S. dollars)

	1978	1979	1980	1981	Projected 1986
Telephone and telex equipment					
United States	2.39	2.43	1.78	1.35	5.3
Japan	3.80	3.61	7.63	5.77	
Germany	4.51	2.39	4.08	3.09	
France	6.25	2.27	4.01	3.03	
Belgium and Luxembourg	3.96	9.71	1.12	.85	
Other	11.48	4.71	4.86	3.68	
Total	32.39	25.12	23.48	17.77	69.9
Transmission equipment					
United States	1.40	1.08	.46	.53	.6
Japan	4.30	1.92	3.11	3.60	
United Kingdom	.02	1.30	2.68	3.11	
France	.35	2.22	.38	.44	
Germany	1.82	.28	.10	.12	
Other	.75	.95	.54	.54	
Total	8.64	7.75	7.27	8.34	9.2
Video and radio broadcasting equipment					
United States	1.31	.84	1.57	1.57	1.8
Japan	26.52	15.07	21.60	21.60	
China	12.56	13.92	11.29	11.29	
Germany	.82	2.09	2.22	2.22	
Singapore	1.98	1.34	1.77	1.77	
Other	3.37	5.88	4.54	4.54	
Total	46.56	39.14	42.99	42.99	48.0
Communications test and measurement equipment					
United States	3.26	4.13	6.01	6.97	9.4
Japan	3.39	6.75	4.67	5.42	
Germany	1.64	2.73	3.36	3.90	
United Kingdom	.22	.29	1.20	1.39	
France	.39	.46	1.05	1.22	
Other	1.54	2.18	2.62	3.03	
Total	10.44	16.54	18.91	21.93	26.8

Source: Foreign Trade Statistical Bulletin (Imports) 1978 to April 1981, Biro Pusat Statistik, Jakarta, and International Trade Administration, Office of Trade Information Services research study, "Survey of Market for Communications Equipment and Systems in Indonesia".

ing over second place from the Germans, and are expected to maintain their position with sales topping $9 million in 1986. While U.S. firms have thus made some market gains, industry sources in Indonesia believe American vendors can do much better if they improve their marketing techniques in certain areas, specifically personal sales, more active promotion of products, and better aftersales service.

A small core of domestic suppliers has emerged as the result of a government policy that actively encourages the local manufacture of telecommunications products and supports joint ventures between local and foreign companies. These domestic firms are not only favored by the Government, many are also government-owed. For the most part, they have entered the market via joint ventures, gaining access to the advanced technology needed to produce sophisticated telecommunications products.

The major companies include P.T. Inti—the biggest local manufacturer, with 713 employees; Lembarga Elektroteknika Nasional (LEN)—a government research organization, with 500 workers, that produces certain kinds of telecommunications equipment on a project basis; and P.T. Radio Frequency Communication—a private company. The Government's gradualist approach to modernizing the tele-

Table 3.—Indonesia: The market for telecommunications equipment and systems by product category, 1980 and projected 1986
(in millions of U.S. dollars)

	1980	Projected 1986
Telephone and telex equipment		
Switches and switching equipment ..	7.65	13.4
Subscriber/user premises equipment.	6.23	23.8
Other telephone and central office equipment	6.85	26.1
Telex, teleprinters, and ancilliary equipment	4.18	13.5
Category total	24.91	76.8
Transmission equipment		
Wire and cable	14.55	34.1
High-frequency radio	8.73	18.0
Microwave	29.11	60.0
Multiplexers	5.82	12.0
Category total	58.21	124.1
Mobile radio		
Land	3.22	4.8
Marine	1.34	2.0
Paging systems	.27	.4
Air-ground	.54	.6
Category total	5.37	7.8
Video and radio broadcasting equipment		
Closed circuit television	1.39	1.9
Radio broadcast transmitters	9.26	13.0
Television broadcast transmitters ..	23.15	32.4
Radio and video studio equipment ..	12.50	17.5
Category total	46.30	64.8

Source: Foreign Trade Statistical Bulletin, 1980, Biro Pasat Statistik, Jakarta, and International Trade Administration, Office of Trade Information Services research study, "Survey of Market for Communications Equipment and Systems in Indonesia".

communications network should allow these firms enough time to eventually catch up to domestic needs. Within the next two decades the Government hopes to develop an essentially self-sufficient domestic telecommunications industry and strongly supports technology transfers to this end. Many foreign firms have already entered into joint ventures with local companies, and this will continue to provide convenient access to the market for foreign manufacturers.

Product Market Profiles

Telephone and telex equipment.—Government-planned projects to develop telephone networks in the countryside and extend telephone networks in the cities are expected to require about $77 million worth of telephone and telex equipment per year by 1986, a three-fold jump over 1980 purchases. The addition of 574,800 telephone lines between 1979 and 1990 should raise sales of switches and switching equipment from $7.6 million in 1980 to more than $13 million in 1986 (see table 3). Among the several cities designated for new lines are Java, Bandung Barat, Semarang, and Jakarta.

Plans also include the automation of manual exchanges in several towns and the installation of digital telephone exchanges in Jakarta and elsewhere; 268,000 of the 342,000 lines to be installed between 1984 and 1990 will be digital. By the year 2000, all of the analog exchanges are scheduled to be replaced with digital systems.

Sales of subscriber/user premises equipment are forecast to advance from $6 million in 1980 to $24 million in 1986. Both public and private sector buyers must have equipment approved or licensed by Perumtel, the sub-directorate of Postel, the Directorate General of Posts and Telecommunications. Several items that are common in the United States have not yet found acceptance in the Indonesian market because of Perumtel-imposed restrictions. For example, it does not allow the use of videotex or teletex, though it states that they will eventually be allowed to operate in the country. Facsimile equipment is widely known but used only by several multinational firms; in the public sector, the technology is applied on an experimental basis only. Buyers in the commercial sector are expected to increase purchases of telex and telex switching equipment, pushing the market to more than $13 million per year by 1986.

U.S. vendors sold telephone and telex equipment valued at $1.3 million in 1981. GTE supplies telephones and central office equipment, and Extel and Rank Xerox supply facsimile, telex, and anciliary equipment. U.S. manufacturers, with their technological know-how and high-quality products, could make deeper inroads into the market, especially by selling key telephone sets and private automatic branch exchanges (PABX's), by entering into joint ventures with local firms for production or sales of equipment in Indonesia.

American companies face stiff competition in the telephone and telex equipment market, particularly from German firms. Siemens is the major German supplier, and its joint venture with P.T. Inti for the manufacture of public telephones assures it a continuing large slice of the market. ITT's German subsidiary ranks second to Siemens in sales of telephone and telex equipment. Through joint ventures with other third-country companies, P.T. Inti also manufactures automatic central telephone systems, key telephones, and PABX's.

Indonesian end-users also obtain key systems, PABX's, and other subscriber/user premises equipment from NEC and Hitachi of Japan, Philips of the Netherlands, and Ericsson of Sweden. NEC sells facsimile equipment as does the German firm, Standard Electrik Lorenz; and through a joint venture with LEN, Harris Communications Co. of the United States supplies telephone and wire transmission equipment.

Transmission equipment.—The market for transmission equipment is expected to grow from $58 million in 1980 and to $124 million in 1986. The biggest demand should be for cable and wire and microwave equipment, Indonesia's two major transmission modes. Cable and wire, however, are completely supplied by 50 local manufacturers, with 4 companies—Kabelindo Murni P.T., Kabelmetal Indonesia P.T., Tranka Kabel, and Sucaco P.T. Knt.—supplying 80 percent of the market.

Microwave transmission, the major telecommunications link between urban and rural areas, is expected to account for almost half ($60 million) of the transmission equipment sales in 1986, with most purchases going for government projects such as the planned expansion of the microwave system between Banjamasim and Balikapan. Japanese firms, particularly NEC and Fujitsu, are the source of most of Indonesia's microwave equipment, although the Dutch firm, NKF, has been able to carve out a slice of the market. Some spurs are made locally by P.T. Radio Frequency Commission in joint venture with Hughes Aircraft Co. of California, and P.T. Inti supplies other equipment.

Though P.T. Inti and P.T. Radio Frequency Communication manufacture some high-frequency (hf) radios locally, nearly all hf radios and multiplexers must be imported, with multiplexers usually purchased as part of turnkey projects. Project-related demand should more than double sales of hf radio equipment, from under $9 million in 1980 to $18 million per year by 1986. For hf radio equipment, buyers have turned to the British manufacturer, Marconi. Philips has successfully marketed its multiplexers.

Though the American firm, Racal, has successfully sold hf radio equipment, other U.S. vendors' sales of transmission equipment have been limited. They probably face an uphill battle in the future because of their low standing with Perumtel. U.S. prices, according to Perumtel, are high compared with the Japanese. American suppliers also fail to supply special credit terms and are slow in submitting their quotations for sales contracts. Improved salesmanship on the part of U.S. vendors may create a better relationship with Perumtel and lead to higher sales.

Light-wave transmission equipment is not expected to find buyers over the next few years because of the current practice of using longer wavelength transmission for very low tension transmission. Neither fiber optics or meteor-burst transmission are used currently, and they are unlikely to be used in the near future.

Mobile radio.—With only 1,000 sets sold per year, the current market for mobile radio is small. About 80 percent of the sets go to organizations in the public sector, such as the Ministry of Defense, the Police Department, Television Republic of Indonesia (TVRI), Radio Republic of Indonesia (RRI), and P.T. Tambang Timah. Development of oilfields and continuing efforts to improve defense and internal security should generate mobile radio purchases of $8 million per year by 1986, a $2.5 million increase over 1980. Very high frequency and ultra high frequency land mobile radios should be most in demand, followed by marine sets. Paging systems are still relatively new, with purchases forecast to remain at a low level during the next few years.

In addition to local firms P.T. Inti and P.T. Radio Frequency Communication, companies from a number of countries, including the United States, Australia, the Netherlands, Japan, and the United Kingdom, compete in this market. However, Motorola Communications International Inc. of the United States is Indonesia's major supplier of land and marine mobile radios. Most air-ground communications equipment is provided by Marconi and the Japanese company, Furano.

Video and radio broadcasting equipment.—The two main users of video and radio broadcasting equipment, TVRI and RRI, are planning improvements in facilities and replacement of old equipment that will cost $65 million per annum by 1986. Receiving the most attention will be television broadcast transmitters, with expenditures increasing from $23 million in 1980 to a projected $32 million in 1986. Little of this spending will be on antenna towers, since they tend to have long lifespans.

Radio and video studio facilities, also slated for upgrading, should account for $18 million of the equipment market in 1986. Among TVRI's expenditures for studio equipment will be two or three mobile vans, adding to its current fleet of seven. RRI, in addition to improving its studio facilities, is also planning to invest in radio broadcast transmitters, raising sales to $13 million per year by 1986. Closed circuit TV expenditures are forecast to remain under $2 million per year through 1986 because of the equipment's long life.

About one quarter of the video and radio broadcasting equipment market is supplied by domestic producers. P.T. Inti and P.T. Radio Frequency Communication make antennas, and LEN manufactures radio and TV broadcasting equipment. Japanese and Chinese companies are the main foreign suppliers of video and radio broadcast equipment. Most radio transmitters and studio equipment bought by RRI comes from the German manufacturer, Telefunken. Other German firms, such as Siemens and Schlumberger, also supply radio equipment. Philips and NEC provide products for a broad spectrum of the broadcasting equipment market. Though American vendors such as RCA, Ampex, and Bosch have captured a small part of the market —4 percent in 1980—industry sources feel that sales could be increased through improved personal sales and more active promotion of products.

Data communications equipment. — Mounting sales of computers should generate a market for data communications equipment in the near future. At present, however, end users have not progressed beyond point-to-point data communications, and modems—about 80 units—are used only by airline companies, particularly Garuda Indonesian Airways. Multiplexers, also little used, are found primarily in government bodies, such as the Jakarta Municipality. Concentrators have not been introduced into the country.

Communications test and measurement equipment.—The steady development and modernization of Indonesia's telecommunications system has spawned a market for communications test and measurement equipment. Sales are projected to reach $27 million in 1986, compared with expenditures of $22 million in 1981. Since most equipment must be tested before it is licensed for use, the main buyer is Perumtel, accounting for 70 percent of total imports. Other end-users include TVRI, RRI, the Ministry of Defense, and, in the private sector, oil companies.

U.S. companies are the leading suppliers of communications test and measurement equipment, holding 32 percent of the market with sales of $7 million in 1981, forecast to rise to over $9 million by 1986. Hewlett-Packard provides Indonesian users with more of this equipment than any other firm. The technical superiority and the outstanding durability of American products should continue to give U.S. firms a competitive edge over third-country vendors such as Fujitsu, Anritsu, Siemens, and Marconi. The best sales opportunities for U.S. manufacturers are likely to be in digital test equipment, spectrum analyzers, telephone test sets, microwave modulators, FET multimeters, FET/VOM meters, and signal operating equipment.

Satellite transmission equipment. — Indonesia's satellite system, called the Domestic Satellite Communications System, consists of two first-generation satellites that were launched in 1976. In 1983 they will be replaced by two second-generation satellites carrying 24 transponders. Most satellite transmission equipment over the next few years will be purchased by owners of earth stations: Postel, TVRI, Pertamina, Ministry of Defense, and RRI. Plans to add 50 earth stations (30 for Postel) to the 150 already in operation will generate the bulk of 1982-84's expected $50 million in satellite transmission equipment expenditures.

American companies, including Hughes Aircraft and Philco, and German firms such as ITT, dominate the market for heavy station equipment, due to the technological superiority of their products, particularly compared to the Japanese. P.T. Inti is the major supplier of light station equipment, however, with LEN also making equipment for earth stations.

End-User Profiles

Public-sector organizations, headed by the Directorate General of Post and Telecommunications (Postel) are the main buyers of telecommunications equipment, with private-sector purchasing making up a small but increasing part of the market (see table 4). The public sector dominates the telecommunications field because many services, such as radio and television, air transportation, and satellite communications, are the responsibility of public organizations in Indonesia. In addition, industries such as mining and energy that require substantial telecommunications equipment are also government operated.

Small organizations are forecast to increase purchases faster than large organizations, but should still only account for a small part of the market through 1986. The Meteorological Department, Garuda Indonesian Airways, P.N. Pertamina, and P.T. Tambang Timah (mining and energy organizations), with expenditures comprising 2.8 percent of the market in 1981, are forecast to increase spending to 5.3 percent of the market in 1986.

Table 4.—Indonesia: By major end-user sector, 1980-81 and projected 1986

(in millions of U.S. dollars)

	1980	1981	Projected 1986
Directorate General of Post and Telecommunications (Postel)	84.0	95.0	133
Television Republic of Indonesia (TVRI)	9.6	9.6	19
Radio Republic of Indonesia (RRI)	4.8	4.8	8
Meteorological Department	.1	.1	1
Republic of Indonesia National Police	2.5	10.0	18
Garuda Indonesian Airways	.5	1.0	4
P.N. Pertamina	2.5	2.5	5
P.T. Tambang Timah	.1	.1	1
Private sector	9.5	10.0	24
Total	113.6	133.1	213

Source: Ministry of Communications, Ministry of TCI, Industrial Planning Centre, and Central Bureau of Statistics.

Table 5.—Indonesia: Statistics of telephone system, 1980

Telephone exchanges by type	
Automatic exchanges	137
Manual central battery exchanges (CB)	14
Manual local battery exchanges (LB)	443
Total	594
Telephone calls completed (in millions)	
Overseas calls	8.4
Manual trunk-calls	17.0
Automatic trunk call pulses	3,248.7
Total	3,274.1
Telephone subscribers by type	
Main automatic connection	319,843
Main manual central battery (CB)	6,065
Main manual local battery (LB)	44,475
Main connection subtotal	370,383
Branch automatic connection	132,516
Branch manual central battery connection (CB)	1,343
Branch manual CB connection	9,178
Branch connection subtotal	143,037
Total	513,420

Source: International Trade Administration, Office of Trade Information Services research study, "Survey of Market for Communications Equipment and Systems in Indonesia".

Of the larger end-users, the up-and-coming buyer is the Republic of Indonesia National Police, a Ministry of Defense organization. Efforts to improve internal security and national defense boosted spending from $2.5 million in 1980 to $10 million in 1981, with expenditures of $18 million forecast for 1986.

Postel.—With a workforce of 26,737, Postel operates a telephone network consisting of 594 exchanges and a telex network made up of 24 domestic exchanges and 1 international telex center (see table 5). It is the largest user of communications equipment in Indonesia. Implementation of plans to expand and modernize exchanges and telephone lines should cost Postel an estimated $133 million per year by 1986, or 62 percent of the projected total market.

Postel wants to further automate telephone networks. Although 88 percent of Indonesia's 599,000 line capacity is automatic, about 90 to 95 percent of the exchanges are electromechanical and only 5 to 10 percent electronic. Furthermore, long-distance transmission is based entirely on analog technology, with the 960 channels now in use to be expanded to 1,200 by the end of 1983.

The telex network handled 6.8 million calls in 1980; the telephone network processed 3,274 million calls. Telephone and telex density is highest in Java, particularly in Jakarta. In 1980 there were four telephones per $100 of GDP and 513,000 telephone subscribers. Since only 30 to 40 percent of the applicants for telephone and telex are accepted, Postel intends to expand telephone and telex capacity, extend service to a larger segment of the population, and increase the number of accepted subscribers.

Television Republic of Indonesia.—Employing 800 people, TVRI has four studios, each equipped with one video and one audio console. Among the major public end-users, its expenditures are forecast to grow the fastest during 1981-86. In 1981 it spent almost $10 million on TV equipment and, with expenditures expected to increase 15 percent a year, it should pour over $19 million per annum into the market by 1986.

Radio Republic of Indonesia.—RRI, with a workforce of 2,800, operates 49 radio stations. Accounting for about 4 percent of the telecommunications equipment market, its expenditures are expected to rise from under $5 million in 1981 to $8 million in 1986.

RRI uses six channels, one for international broadcasting (made up of two lines), three channels for national broadcasting, and two channels for metropolitan broadcasts. Over 310 commercial radio stations and 120 noncommercial stations also purchase radio broadcasting equipment, though all stations except RRI are prohibited from using FM transmitters. Since the AM band is currently saturated, it is likely that by 1983 other radio stations will be permitted to use FM transmitters.

Private sector.—Major buyers in the private sector, including oil companies, hotels, banks, insurance companies, and newspaper publishers, spent $10 million for telecommunications equipment in 1981. Timber and oil companies are frequent purchasers of mobile radio systems, and assorted private firms buy PABX's. Private-sector spending should control an increasing share of the market, with expenditures forecast to rise to $24 million in 1986.

Marketing Practices

Sales channels. — The Indonesian Government purchases equipment through tenders issued on an irregular basis, either 1 or 2 years before the start of a Five-Year Development Plan or simply when the need for certain equipment arises. For big-item purchases, the Government usually deals directly with suppliers, but for common items such as consoles and telephone sets, equipment may be obtained from local agents or subsidiary companies.

A foreign company can only supply telecommunications equipment if it is affiliated with a local organization, such as an agency, trade representative, or distributor, that is at least 51-percent Indonesian

Leading Suppliers

Name	Country(ies) of Manufacture	Type of Equipment
Telephone and telex equipment		
P.T. Inti	Indonesia	Telephone sets, automatic central office equipment, telephone systems, key telephones, PABX's
Lembaga Electroteknika National (LEN)	Indonesia	Telephone and wire
Extel	United States	Telex, teleprinter, and ancilliary equipment
GTE	United States	Other telephone sets and central office equipment
Rank Xerox	United States	Telex, teleprinter, and ancilliary equipment
Ericsson	Sweden	Subscriber/user premises equipment, other telephone sets, and central office equipment
Standard Electrik Lorenz	Germany	Switches and switching systems, subscriber/user premises equipment, other telephone sets, and central office, telex, teleprinter, and ancilliary equipment
NEC	Japan	Switches and switching systems, subscriber/user premises equipment, other telephone sets, and central office equipment
Philips	Netherlands	Switches and switching systems, other telephone sets, and central office, telex, teleprinter, and ancilliary equipment
Sagem	France	Telex, teleprinter, and ancilliary equipment
Siemens	Germany	Switches and switching systems, subscriber/user premises equipment, other telephone sets, and central office, telex, teleprinted, and ancilliary equipment
Transmission equipment		
Kabelindo Murni P.T.	Indonesia	Wire and cable
Kabelmetal Indonesia P.T.	Indonesia	Wire and cable Land, paging systems
Transmission equipment—continued		
Lembaga Electroteknika National (LEN)	Indonesia	Microwave transmission systems
P.T. Inti	Indonesia	Transceivers, hf radio, microwave equipment, multiplexers
P.T. Radio Frequency Communication	Indonesia	Hf radio, microwave spurs
Sucaco P.T. Knt	Indonesia	Wire and cable
Tranka Kabel	Indonesia	Wire and cable
Racal	United States	Hf radio
Fujitsu	Japan	Hf radio, microwave equipment
Marconi	United Kingdom	Hf radio
NEC	Japan	Microwave equipment, multiplexers
NKF	Netherlands	Microwave equipment
Philips	Netherlands	Multiplexers
Video and radio broadcasting equipment		
Lembaga Elektroteknika National (LEN)	Indonesia	Radio telecommunications and broadcasting systems, TV broadcast transmitters
P.T. Inti	Indonesia	Antenna towers
P.T. Radio Frequency Communication	Indonesia	Antenna
Ampex	United States	CCTV, video studio equipment
Bosch	United States	CCTV, video studio equipment
RCA		
Marconi	United Kingdom	CCTV, radio studio equipment, video studio equipment
NEC	Japan	CCTV, radio broadcast transmitters, TV broadcast transmitters, antenna towers, video studio equipment
Philips	Netherlands	CCTV, radio broadcast transmitters, antenna towers, video studio equipment
Schlumberger	Germany	Radio studio equipment
Siemens	Germany	Radio broadcast transmitters
Struder	Switzerland	Radio studio equipment
Telefunken	Germany	Radio broadcast transmitters, radio studio equipment

Name	Country(ies) of Manufacture	Type of Equipment
Mobile radio		
P.T. Inti	Indonesia	Mobile radio, earth stations
P.T. Radio Frequency Communication	Indonesia	Mobile radio
RFC	Indonesia	Land
Granger	United States	Land
Motorola	United States	Land, marine
Codan	Australia	Land
Furuno	Japan	Marine, air-ground communications
JRC	Japan	Land
Marconi	United Kingdom	Marine, air-ground communications, marine
NEC	Japan	Paging systems
Philips	Netherlands	Land, paging systems

owned. If this is impossible, a liaison officer who monitors projects and bids for tenders is acceptable. Tenders may sometimes be submitted to embassies, in which case a deposit of $32 is required.

Turnkey contracts are only requested if massive amounts of equipment are required or if local expertise is insufficient to handle a project. Installation by Indonesian organizations is preferred.

Though U.S. suppliers may be hard-put to come up with competitive prices and credit terms, increased advertising in established electronics magazines, in product brochures, and in the CCIR—a book on specifications commonly used by the Government—should help them in gaining a larger share of the market.

Financing. — Since government organizations usually spend more than their budget allotments, they are forced to take out loans from the World Bank through the agencies of the Government. Thus, credit terms are probably the most important consideration when public end users select a supplier. Japanese companies hold a big advantage in this regard by offering long-term credit with no interest charges for up to 2 years. Suppliers from other countries, including the United States, do not provide grace periods during which interest rates are suspended, and usually charge higher interest rates.

Trade Restrictions

While no import quotas or trade restrictions are imposed in Indonesia, import licenses are required by the Ministry of Communications and the Telecommunications Board for certain security-related equipment such as walkie talkies, transmitters, and receivers. Foreign suppliers interested in selling such equipment should instruct their representatives to cosult with officials from the Department of Foreign Affairs.

Customs duties range from 10 percent for telephone and telex receivers to 60 percent for certain kinds of TV broadcast receivers. In addition, a sales tax of between 7 and 20 percent is charged, even for duty-free products.

The Indonesian Government attempts to encourage importation of advanced technology from the United States, Japan, and Western European countries by excluding telecommunications equipment from the ASEAN-PTA (Preferential Trading Arrangement). In addition, it has avoided involvement in bilateral agreements with other countries for telecommunications equipment.

Indonesia: Basic Economic Indicators

Population:	157.6 million (1982)	Imports c.i.f.:	$20.0 billion (1981-82)
Area:	1,906,240 sq. km.	U.S. share	13.5% (1981-82)
Administrative units:	27 (first-level) provinces, 282 second-level areas	Major trading partners:	Japan, United States, Saudi Arabia, Singapore, Germany
GNP:	$86 billion (1981)	Exchange rate:	660 rupiah=US$1 (1982)
Contributions to GDP:	Services 32% (1980)	Fiscal year:	April 1-March 31
	Industry 42%	Current account balance:	—$2,405 million (1981-82)
	Agriculture 26%	International reserves:	
Per capita income:	$573 (1981)	Federal budget	$4,900 million (1981-82)
Inflation rate:	10% (1981)	revenues:	$22.3 billion (1981-82)
Exports f.o.b.:	$23.2 billion (1981-82)	expenditures:	$22.3 billion (1981-82)
U.S. share	18.6% (1981)	Labor force:	60 million (1980)

Useful Addresses

Embassies:

American Embassy
Commercial Section
Medan Merdeka Selaton 5
Jakarta Pusat
tf: 340001-9
tx: 44218 amemb jkt

Embassy of the Republic of Indonesia
2020 Massachusetts Avenue, N.W.
Washington, DC 20036
tf: 293-1745

Telecommunications administration:

Departemen Perhubungan
Direktorat Jenderal Pos dan Telekomunikasi
Jalan Kebon Sirih No. 37
Jakarta Pusat
Attn: Director General
tf: 346000
tg: gentel jakarta
tx: 44407 postel ia

PTT:

Perusahaan Umum Telekomunikasi (Perumtel)
Jalan Cisanggarung 2
Bandung
Attn: Chief Executive Director
tf: 4100
tg: diruttel bandung
tx: 28220 diruttel bd

Leased lines and data communications:

Perusahaan Umum Telekomunikasi (Perumtel)
Jalan Cisanggarung 2
Bandung
tf: 4100
tg: diruttel bandung
tx: 28220 diruttel bd

Radio broadcasting:

Radio Republik Indonesia (RRI)
Jalan Merdeka Barat 4-5
Tinakat VII
Tromolpos 157
Jakarta Pusat
Attn: The Director
tf: 377508
tg: rri jakarta

Television broadcasting:

Yayasan Televisi Republik Indonesia (TVRI)
Pusat Senayan
Jakarta Pusat
Attn: Director General
tf: 582 160
tg: telviri jakarta
tx: 46154 tvrt, jakarta

Technical standards:

Badan Kerjasama LIPI-YDNI (YDNI)
Jln. Teuku Chik Ditiro 43
P.O. Box 250
Jakarta Pusat
tf: 35 16 58
tg: lipi jakarta

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

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Washington, D.C. 20230
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The Survey summarizes an 82-page research report prepared by Applied Research Corporation, Republic of Singapore, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey as well as the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk Telephone: (703) 487-4650

When placing an order for this research, please request "Survey of Market for Communications Equipment and Systems in Indonesia," ITA 82-05-501, February 1982.

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Country Market Survey

MEDICAL EQUIPMENT

Philippines

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AT URBANA-CHAMPAIGN

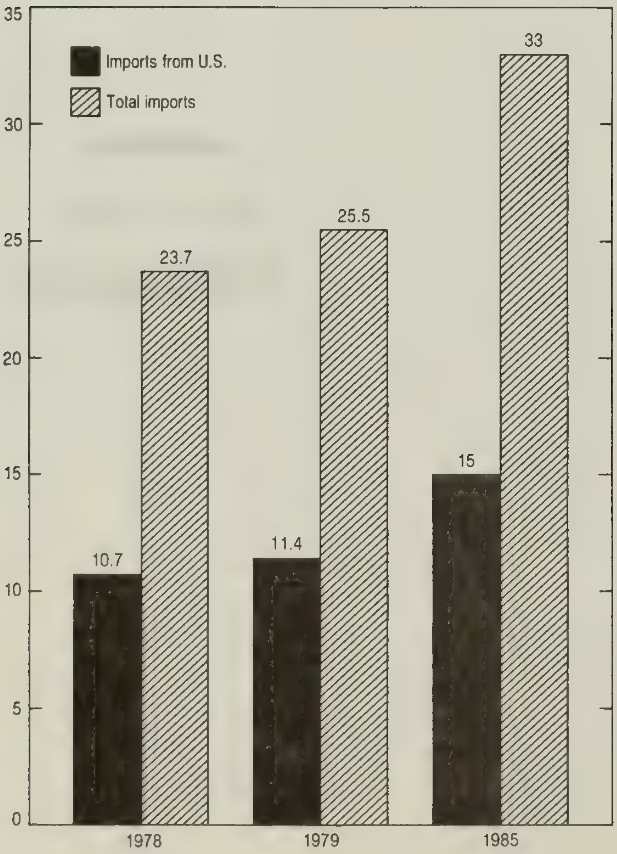
U.S. DEPARTMENT OF COMMERCE
International Trade Administration

The Philippine market for medical equipment is expected to exceed $33 million[1] in 1985, rising an average 4.5 percent annually from its 1980 level of $26.6 million (see table 1). Advances in medical technology are boosting demand for the latest and most sophisticated apparatus, while pressures to spread the benefits of health care throughout the entire population, including low-income families and those in rural areas, are necessitating greater expenditures on basic, standard equipment. Underlying all purchase decisions is the need to contain costs in the face of continual increases.

General hospitals bought 37 percent of the equipment sold in 1980, making them the largest end-user group, although they spend less per unit than the specialized hospitals (see table 2). Their focus is on standard, durable, and cost-effective medical equipment that can help in the treatment of such poverty-influenced diseases as influenza, gastroenteritis, tuberculosis, pneumonia, malaria, and dysentery, which are still prevalent among the population.

Philippines: Estimated imports of medical equipment, 1978, 1979 and 1985

(in millions of U.S. dollars)



Source: International Trade Administration, Market Research Division, Office of Trade Information Services, market research study.

Table 1.—Philippines: Estimated market for medical equipment by application area, 1979-81 and projected 1985

(in thousands of U.S. dollars)

	1979	1980	1981	1985
Cardiological equipment	3,041	3,193	3,353	4,356
Pulmonary apparatus	1,092	1,147	1,204	2,125
Neurological equipment	26	28	33	52
Opthalmological equipment	894	966	1,043	1,741
Pediatric equipment	977	1,026	1,077	1,243
Renal equipment	483	507	532	795
Operating room equipment	6,582	6,733	7,070	7,641
General hospital equipment	8,753	8,886	8,940	9,105
Clinical laboratory equipment	1,037	1,151	1,428	2,150
Miscellaneous health care equipment	55	62	71	83
Disposables	1,021	1,136	1,228	1,451
Orthotic and prosthetic equipment	82	86	92	105
Architectural, transportation and mobility equipment	536	558	571	645
Physical and occupational therapy equipment	383	397	411	497
Sensory aids and adaptive systems	606	752	847	1,233
TOTAL	25,568	26,628	27,900	33,222

Source: National Census and Statistics Office (NCSO) and International Trade Administration, Market Research Division, international market research report (see Additional Information box).

The 209 specialized medical institutions accounted for 28 percent of 1980 medical equipment purchases. They are able to charge higher fees and are patronized by the more affluent members of society. They tend to acquire the most advanced equipment in their respective fields and offer the services of top-caliber physicians.

Ever since residency programs for foreign doctors and medical students were terminated in the United States, university medical centers and major private hospitals have been cooperating to upgrade their facilities in order to provide high-quality local residency programs. So far, the Government has designated 43 hospitals as teaching and training institutions.

In 1980, the 15 military hospitals together invested $2.2 million in new medical equipment. They maintain expensive, sophisticated equipment and use a complete line of disposables.

Large corporations also offer good markets for medical equipment. Companies with over 100 employees are mandated by law to have at least one physician and one nurse on call. Larger companies such as Victorias Milling Company, a sugar refinery in Negros

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[1] All valuess are shown in U.S. dollars. Local currency data are converted at the following exchange rate: US$1=P7.38 (1978 and 1979) and P7.46 (1980 and subsequent years). Values for years through 1980 are expressed in current rather than constant dollars; values for 1981 and subsequent years are expressed in 1980 constant dollars.

Table 2.—Philippines: Expenditures for medical equipment, supplies, and furniture by major users sectors, 1980 and projected 1985

(in thousands of U.S. dollars)

	1980			1985		
	Equipment	Supplies	Furniture	Equipment	Supplies	Furniture
General hospitals	9,852	80,120	2,100	11,960	105,000	2,500
University medical centers	2,929	10,560	150	3,322	25,000	200
Specialized medical institutions, e.g. cancer clinics	7,456	40,200	810	10,631	60,000	1,200
Military hospitals	2,245	9,600	160	1,993	10,000	200
Clinical laboratories	3,462	7,120	40	3,987	9,500	50
Mobile and permanent health care/population screening centers	186	450	10	233	700	20
Physicians (private practitioners)	498	980	310	1,096	1,200	400
Total	26,628	149,030	3,580	33,222	211,400	4,570

Source: Ministry of Public Health.

Occidental, have set up their own hospitals, and some mining companies have purchased advanced medical equipment.

More than three-fourths of the market is supplied by imports, and this percentage is unlikely to change over the next 5 years (see tables 3 and 4). U.S. firms have been providing 45 percent of the imports since 1978, down from about 60 percent in the mid-1970's (see figure). The American lead is being challenged by Japanese firms who captured 21 percent of 1979 sales.

Competitive Environment

Output of the eight companies comprising the infant domestic medical equipment manufacturing industry totaled \$3.7 million in 1979 and is expected to reach \$5.6 million in 1985. All the firms are private and wholly owned by Filipinos, and only one has as many as 100 employees. They produce primarily beds, tables, cabinets, and wheelchairs and are heavily dependent on imported components such as motors and filters. Since the market is not large enough to sustain a sizable manufacturing volume, and technological capability is largely underdeveloped, the industry is not expected to produce any advanced equipment within the foreseeable future.

The main advantage offered by local producers is price, and this advantage is being pushed hard in small clinics and provincial hospitals. Although most end users concede that the products are still somewhat crude and unsophisticated, they are attracted by the lower costs. Government institutions also support local industry by purchasing local products whenever possible, and a 100-percent import duty is applied to imported hospital furniture.

Terms offered by domestic manufacturers are usually 60 to 90 days on open account, which is equivalent to the terms offered by importers of equipment. On large orders, a 50-percent down payment is frequently requested.

Although the U.S. share of the Philippine medical equipment market has dropped, it has risen in value, from \$4.4 million in 1975 to \$11.4 million in 1979, and is forecast to top \$15 million in 1985. U.S.-made equipment is considered comparable in quality and durability to the best available, and in many cases is the best in the market. Thus most hospitals are open to U.S. goods notwithstanding their high cost. Moreover, many Filipino doctors have been trained in the United States and are familiar with company names and brands. The tendency of doctors to work with equipment they are used to handling and the policy of hospitals to standardize equipment with interchangeable parts have helped to keep the market in the hands of U.S. suppliers.

The main criticism aired against U.S. suppliers is the lack of good aftersales service by their local distributors, especially in the provinces. Spare parts have been delayed for 6 months and longer. Little repair and maintenance service is offered on a regular basis, and still less training is provided for hospital staff who will handle the equipment.

The decline in U.S. sales over the past 5 years is due partly to the lack of credit financing arranged by U.S. suppliers. In contrast, Germany financed the equipment for a Philippine Heart Center for Asia, thereby opening a market for Siemens. France was approached for funds for the new Philippine Lung Center. Belgium has made equipment loans to several government hospitals, including a substantial loan to the Jose Reyes Memorial Hospital, the main general and teaching hospital in the Ministry of Health system.

Third-country suppliers also send more people to the Philippines on 2-week visits and regular assignments than do U.S. suppliers. According to one end user, Japanese executives are available on call by their customers. Several Japanese companies have long-range plans for developing the Philippine market for their products. The proximity of Japan

Table 3.—Philippines: Imports of medical equipment by country of origin, 1978, 1979, and projected 1985

(in thousands of U.S. dollars)

	1978	1979	1985
Medical/surgical, electromedical, diagnostic and opthalmic apparatus (90.17)			
United States	2,821.2	3,072.3	3,994
Japan	1,428.3	1,743.9	2,267
Germany	212.4	234.0	304
United Kingdom	148.6	152.1	198
All other	521.5	379.8	493
Total	5,132.0	5,582.1	7,256
Electromedical apparatus (medical, surgical, opthalmic instruments) including parts, n.e.s. (90.17)			
United States	687.1	721.3	937
Japan	296.9	312.8	407
Germany	84.6	87.2	101
United Kingdom	16.1	16.7	19
All other	12.4	15.3	19
Total	1,097.1	1,153.3	1,483
Mechanotherapy and respiratory appliances (90.18)			
United States	3,729.3	3,946.5	5,239
Japan	1,709.2	1,931.3	2,401
Germany	854.6	1,007.6	1,200
United Kingdom	310.8	335.8	437
All other	1,165.4	1,175.7	1,639
Total	7,769.3	8,396.9	10,916
X-ray apparatus (90.20)			
United States	2,044.4	2,187.0	3,109
Japan	704.5	772.3	977
Germany	629.0	683.4	889
United Kingdom	314.5	341.7	444
All other	2,598.0	2,850.2	3,466
Total	6,290.4	6,834.6	8,885
Chemical analysis instruments (90.25)			
United States	676.2	703.7	914
Japan	367.8	389.8	507
Germany	211.3	221.8	288
United Kingdom	105.1	108.5	140
All other	356.1	381.2	496
Total	1,716.5	1,805.0	2,345
Laboratory instruments and apparatus, measuring and controlling scientific instruments and parts n.e.s. (90.25)			
United States	772.1	811.2	1,054
Japan	323.6	343.4	446
Germany	106.7	109.9	143
United Kingdom	93.6	96.1	125
All other	412.3	437.6	569
Total	1,708.3	1,798.2	2,337
Combined total			
United States	10,730.3	11,442.0	15,247
Japan	4,830.3	5,493.5	7,005
Germany	2,098.6	2,343.9	2,925
United Kingdom	988.7	1,050.9	1,363
All other	5,065.7	5,239.8	6,682
Total	23,713.6	25,570.1	33,222

Source: See source notation of table 1.

enables its suppliers to provide easy access to spare parts, giving them a distinct advantage over their American counterparts. Japanese suppliers have been particularly aggressive in offering high-performance products at competitive prices and backing up their selling efforts with credit financing arrangement and good aftersales service. European suppliers also visit the Philippines frequently, and they usually retain an expatriate there to look after their interests.

Specific Product Markets

Cardiological equipment.—Sales of cardiological equipment are projected to rise an average 6.4 percent annually, from $3.2 million in 1980 to almost $4.5 million in 1985. Even higher growth rates are foreseen for sales of defibrillators, central station and bedside intensive care systems, and electrocardiographs (ECG's). Increasing attention is being paid to cardiovascular ailments, particularly among the more affluent members of society who can afford to pay the fees charged by top private hospitals. Very little demand exists for phonocardiographs, ballistocardiographs, and telemetry systems for transmitting ECG's. All cardiology equipment is imported, with U.S. firms accounting for nearly half the sales. U.S. companies lead in all segments of this market except ECG's. American Optical Medical Division (now part of Picker International) is a market leader with its coronary care and intensive

Table 4.—Philippines: Estimated imports of medical equipment by application area, 1978, 1979, and projected 1985

(in thousands of U.S. dollars)

	1978		1979		1985	
	Total	From U.S.	Total	From U.S.	Total	From U.S.
Cardiological equipment	2,781.2	1,251.3	3,041.4	1,368.5	4,356	2,003
Pulmonary apparatus	982.3	471.5	1,092.1	502.3	2,125	978
Neurological equipment	20.5	10.6	26.2	13.6	52	29
Ophthalmological equipment	786.2	330.2	893.6	357.4	1,741	792
Pediatric equipment	885.3	460.3	976.9	468.9	1,243	572
Renal equipment	374.2	160.9	483.1	251.2	795	443
Operating room equipment	6,151.3	2,768.0	6,582.1	2,885.4	7,641	3,238
General hospital equipment	8,012.3	3,065.5	8,753.2	3,056.5	9,105	4,097
Clinical laboratory equipment	1,270.1	998.2	1,037.4	1,228.6	2,150	1,517
Miscellaneous health care equipment	48.6	23.3	55.1	26.4	83	39
Disposables	984.1	413.3	1,021.1	459.4	1,451	659
Orthotic and prosthetic equipment	70.1	31.5	82.3	46.0	105	55
Architectural/transport and mobility equipment	521.2	218.9	536.3	257.4	645	277
Physical and occupational therapy equipment	365.1	171.6	383.2	183.2	497	234
Sensory aids and adaptive systems	461.1	355.2	606.1	337.2	1,233	349
Total	23,713.6	10,730.3	25,570.1	11,442.0	33,222	15,282

Source: See source notation of table 1.

care unit monitors, cardioverter systems, modular parts, and accessories. The company also leads in blood pressure monitors, defibrillators, and related equipment and has a small share of the ECG market.

Hewlett-Packard also holds an important position with its ECG, cardiovascular, and cardiography equipment. Medtronic, Inc., Cardiac Pacemakers, Inc., and American Edwards Laboratories supply heart valves, implantable pulse generators, and cardiac pacemakers. Other cardiology equipment is furnished by American Edwards Laboratories, Physio-Control, and Mennen Medical.

The major third-country supplier, Nihon Kohden of Japan, sells defibrillators, echo cardiographs, patient monitors, central station monitors, and ECG machines. Japanese firms have captured an important share of the ECG market and are particularly active in promoting their products with government and provincial hospitals and clinics as well as cardiologists in private practice. Major Japanese ECG manufacturers exporting to the Philippines include Fukuda and Toshiba. Other leading suppliers of cardiological equipment include Siemens and Hellige of Germany and Cardiac Recorders of the United Kingdom.

Pulmonary apparatus.—Concern for the low-income population, which suffers a high incidence of lung-related diseases—tuberculosis, pneumonia, and bronchitis—is expected to boost sales of pulmonary apparatus by an average 13 percent annually between 1980 and 1985. Bestselling equipment includes positive pressure and volume controlled breathing apparatus and resuscitation equipment.

All pulmonary apparatus is purchased abroad from such market leaders as Bird Corporation, American Edwards Laboratories, Ohio Medical Products, Air-Shields, and Puritan Bennett Corporation. Other American firms represented in the Philippines include Beckman Instruments, Devilbiss Co. Health Care Division, and Hudson Oxygen Therapy Sales Co.

Commonwealth Industrial Gases Inc. (C.I.G.) of Australia is dominant in resuscitation equipment and breathing apparatus. They partly own their Philippine distributor, National Industrial Gases and Cebu International Gases. Their equipment is good, and they are highly respected. On a vacuum-piping job, their price quotations are appreciably below those of other major vendors. Vickers (United Kingdom) and Sharp (Japan), which recently launched its portable nebulizers, are active in the pulmonary equipment market.

Neurological equipment.—U.S. firms supply almost 90 percent of the neurological equipment market, with sales projected to climb from $13,600 in 1979 to $29,000 in 1985. Leading U.S. vendors include Codmann & Shurtleff Inc., Grass Instrument Company, V. Mueller Division (of American Hospital Supply), and American Cystoscope Makers, Inc. (ACMI). Electroencephalographs have the best sales potential over the next 5 years. Among third-country suppliers, Hellige of Germany (Litton subsidiary) is active in that market.

Ophthalmological equipment.—The ophthalmological equipment market is expected to increase by an average 12 percent yearly, approaching $2 million in 1985. Ophthalmologists, opticians, and optometrists enjoy lucrative practices in the urban centers. The major suppliers are American—Bausch and Lomb Inc. and American Optical. Welch Allyn Corporation and Coherent Inc. are recognized leader in ophthalmic diagnostic instruments, while Medical Instruments Research Associates (MIRA) is ably represented in the electro-ophthalamic apparatus market.

Third-country competition comes primarily from Japanese companies who dominate the diagnostic instruments market. Instead of using the regular hospital equipment distributors, they sell through manufacturers and distributors of optical goods who deal mostly with optometrist and ophthalmogist clinics. Shin Nippon, Seiwa, Neitz, and Tohwa are all active in the Philippines. Other firms such as Rud Riester (Germany), and Haag Streit (Switzerland) have made some inroads, and China National of the People's Republic of China has entered the field.

Pediatric equipment.—Demand is rising slowly for pediatric equipment despite the country's high birth rate of 3 percent per annum. Sales are expected to advance an average 4 percent annually from $1 million in 1980 to $1.2 million in 1985. Ohio Medical Products, the dominant supplier, furnishes both regular and intensive care (ICU) incubators, pediatric resuscitation equipment, and a complete range of other pediatric equipment, as well as accessories. Air-Shields (Isolette brand) is the next leading supplier, providing much the same product range. Other well-known suppliers include Bourns Inc. and Bird Corporation. Among third-country suppliers, Vickers (United Kingdom), Atom (Japan), and Hellige (Germany) stand out.

Renal equipment.—Above average growth of 9.4 percent yearly over the next 5 years is foreseen for sales of renal equipment, brought about primarily by advances in medical technology. Extracorporeal Medical Specialties, Inc. and Travenol Laboratories Inc. are the market leaders, along with the Cordis Company, which appears to have gained a reputation for its artificial kidneys, and Becton Dickinson & Co. The major third-country competition comes from Siemens and Toshiba.

Operating room equipment.—The technical competence of Philippine physicians is rapidly advancing, particularly in the specialized medical institutions such as the Philippine Heart Center for Asia, university medical centers, and some of the first-class private hospitals. Surgeons are now transplanting organs, implanting artificial devices, and doing open-heart surgery and microsurgery. Operating room (OR) equipment sales, $6.7 million in 1980, are projected to reach $7.6 million in 1985, led by electrosurgical units and anesthesia equipment. More than 80 percent of operating room equipment is purchased from overseas suppliers.

Operating tables are made locally by Bataan Manufacturing Company, the largest Philippine producer of medical equipment, Medical Center Drug Corporation, and Orto Medical Enterprise. St. Martin Scientific and Hospital Supply manufactures multipurpose operating tables, and Rodel Manufacturing makes hydraulic operating tables. The leading suppliers of surgical lights are Pilling Company, a subsidiary of Narco; Castle Co., a subsidiary of Sybron (United States); and American Sterilizer Co. (AMSCO). Seiwa of Japan distributes OR lights and tables, catheters, electrosurgical apparatus, and instrument sets. Stille of Sweden is strong in the OR table market, while S.K.Y. of Japan and Brandom of the United Kingdom furnish OR lights. Daiwa and Kobayashi of Japan also supply OR lights and tables. China National sells OR lights and tables and electrosurgical instruments, although its products are not considered very durable.

American firms important in the Philippines include Ritter, which pioneered the market in electrosurgical apparatus, AMSCO, the Birtcher Corporation, Valleylab Inc., Burdick Corp., and Neomed, Inc. Frigitronics Inc. leads in cryosurgical instruments, although this market has greatly diminished.

Ohio Medical Products and Foregger are major vendors of anesthesia equipment. Also important in the market are Allied Health Care Products, Inc. (Gomco brand), Air-Shields Inc., and J. Sklar Manufacturing Co., Inc., which has been competing in the market for drainage pumps and suction units. Some anesthesia equipment is made locally by Esphar Medical Center.

J. Sklar Manufacturing Co., Inc., V. Mueller (American Hospital Supply), E. Miltenberg Inc. (Miltex brand), and Storz Instrument Company are leading suppliers of surgical hand instruments. Catheters and oxygen, drainage, and suction systems are sold by Abbott Laboratories, Sherwood Medical Industries Inc., Pharmaseal Division of American Hospital Supply, and Davol.

Among third-country manufacturers, market leaders include Eschmann Bros. & Walsh Ltd. of the United Kingdom, which sells catheters, suction units, surgical instruments, and OR tables; Warne Surgical Products of the United Kingdom, with its catheters; Atom of Japan, suction units; S.K.Y., electrosurgical apparatus; and Sklar-Witte of Germany, surgical instruments.

Over 38 percent of the surgical hand instruments are purchased from Pakistan and India. Such products are inexpensive and used mainly by medical students, both student doctors and nurses. Reputable Pakistani suppliers include Hope and Heal, and G. T. Surgical.

General hospital equipment.—Sales of general hospital equipment are forecast to remain steady at around $9 million a year through 1985. The Government is paying increasing attention to general hospitals with the aim of diffusing health care to as wide a segment of the population as possible. Bestselling equipment will include ultrasonic scanners, ultrasonic physiotherapy equipment, and central station and bedside patient monitoring systems.

Domestic manufacturers furnish about 35 percent of the general hospital equipment. Bataan, Orto Medical Enterprise, and Master Manufacturing produce mechanical hospital beds which sell for about $165, compared to $500 for Japanese beds.

Blood pressure equipment comes from the domestic firm Buda Enterprises, but the dominant suppliers of blood pressure and pulse monitors are Japanese—TOA Electric, Sankyo, and Suzuken.

American manufacturers such as Del Mar Avionics, Ohio Nuclear Inc., and Picker Corporation lead in gamma scintillation cameras. Picker also supplies mechanical isotope scanners, ultrasonic scanners, diagnostic X-ray equipment, and fluoroscopic image intensifier systems. J.A. Preston Corporation and Birtcher Corp. are noted for ultrasonic physiotherapy equipment. PhysioControl Corp. supplies central station as well as bedside patient monitoring systems.

Stryker Corporation is one of the leading suppliers of electrotherapy units and electronic cast cutters. Hewlett-Packard, American Optical, Quinton Instruments Co., and Birtcher Corp. are respected for electrostress monitors. Del Mar Avionics has installed a large stress-testing system at the Philippine Heart Center for Asia, and Marquette Electronics, Inc. has installed the first fully computerized stress system at the Government Service Insurance System (GSIS) Hospital.

Ohio Medical Products and Bird Corp. are major suppliers of resuscitator/inhalator/aspirator units. Puritan Bennett, Ohio Medical, and Bird also sell oxygen flowmeters and gages.

The most active third-country suppliers in the market for stethoscopes and sphygmomanometers are Daiwa, Kobayashi, Rud Riester, and Yanasi. Rud Riester also sells quantities of laryngoscopes. Terumo, Daiwa, Yanasi, and A.W. Showell (United Kingdom) are major suppliers of syringes and surgical needles. Suzuken supplies electronic stethoscopes and amplifiers and electronic blood pressure indicators.

X-ray equipment is the only sophisticated equipment not dominated by U.S. suppliers. Siemens (Germany), Philips (Netherlands), Shimadzu, and Toshiba (Japan) are the major vendors of large diagnostic X-ray machines, smaller X-ray units, and nuclear medical equipment. Competing with Siemens in radiographic equipment are Toshiba, Shimadzu, and Eisai. Small and portable X-ray units are furnished primarily by the Japanese: Shimadzu, Eisai, Nihon Kohden, and Hitachi. Domestic suppliers of X-ray apparatus include Buda Enterprises, Esphar Medical Center, and St. Martin Scientific.

Clinical laboratory equipment.—Advances in diagnostic techniques as well as increasing recognition by hospital administrators of hospital laboratories as profit centers are expected to raise sales of clinical laboratory equipment from their 1980 level of $1.2 million to more than $2 million in 1985. Simple devices are made locally, but all sophisticated equipment is imported.

Leading American suppliers include Beckman Instruments, Hewlett-Packard, Varian Associates, Tracor, Inc., Clay Adams, and Bausch and Lomb for gas chromatographs; Coleman Instruments Division of Perkin Elmer, Varian, and Instrumentation Laboratory Inc. for atomic absorption/emission spectrophotometers; Coleman, Bausch and Lomb, Corning Glassworks, H.G. Fisher International, Van Water and Rogers, and Instrumentation Laboratory for flame photometers; Corning and Instrumentation Laboratory for blood gas analyzers; American Optical for microtomes; Hycel Inc., Abbott Laboratories, and Gilford Instrument Laboratories for blood chemistry and automated sample analyzers; Clay Adams and Damon/ICE Division for centrifuges; and Turner Associates, Corning, and Gelman Instrument Company for electrophoresis systems.

Leading third-country firms include Hitachi-Perkin Elmer, tops in spectrophotometers; Radiometer of Denmark, blood gas analyzers; MSE of the United Kingdom, refrigerated centrifuges; and Buchler of Germany, electrophoresis systems.

Miscellaneous health care equipment.—Sales of miscellaneous health care equipment are forecast to grow an average 6 percent yearly between 1980 and 1985, reaching $83,000. The greatest demand is expected to be for X-ray units for mass chest surveys and mammographic equipment, both X-ray and thermographic.

Just over half the market is supplied by imports. Picker recently installed mammographic equipment at Rizal Provincial Hospital, and G.E. has a unit at the National Cancer Control Center.

Disposables.—The increasing sophistication of the Philippines health care system is also encouraging the greater use of disposables in the more advanced hospitals. Sales are projected to rise by more than 5 percent annually, exceeding $1.5 million in 1985. Greatest demand is expected for prepared trays, followed closely by single-use oxygen masks and disposable thoracic catheters, gastric feeding unit/bags, otoscope specula, scalpels, and monitoring electrodes.

Currently, all disposables are imported, but local production is expected to begin by 1985. Leading American suppliers include Sherwood Medical Industries Inc., Beckton Dickinson & Co., and Ohio Medical Products.

Rehabilitation equipment.—Sales of rehabilitation equipment are expected to increase an average 6 percent annually, rising from $1.6 million in 1979 to $2.5 million in 1985. American companies supplied over half the imported rehabilitation equipment used in the Philippines in 1979. Stryker, American Sterilizer Co., Zimmer U.S.A., and J.A. Preston are known for their orthotic and prosthetic equipment. Physical and occupational therapy equipment is sold by Preston, Birtcher, and Quinton.

Health Care System

The Ministry of Health (MOH) sets policy and programs for the health care sector. Its administrative units include the Bureau of Health Services, the Bureau of Medical Services, Bureau of Research and Laboratories, and the Food and Drug Administration. The Ministry supervises the health departments of Chartered Cities as well as national, provincial, city, and municipal hospitals, dispensaries, and clinics. MOH exercises control over private hospitals through the Hospital Licensure Act which requires hospitals to meet and maintain specific standards and obtain Ministry approval on all plans for expansion and construction.

The Office of the President provides medical services for the general public through the University of the Philippines, Philippine General Hospital (UP-PGH), and five other facilities. Other agencies delivering health care to special segments of the population include the Bureau of Prisons and the Ministries of National Defense, Social Services and Development, and Education and Culture. Local governments have established hospitals and provide other medical services.

Substantial health care services are furnished by government/private sector groups such as the Philippine National Red Cross, which operates 53 clinics and 25 blood banks (see table 5). The Philippine Tuberculosis Society runs several clinics, and the National League of Puericulture Centers has 743 centers and 51 maternity wards. Some 50 mobile clinics are operated by various agencies, and 28 private MARIA clinics are run by the Philippine Medical Association (see table 6).

University medical centers comprise the prestigious government-owned UP-PGH (973 beds) and 10 private medical schools, including the highly regarded University of Sto. Tomas Hospital (706 beds), Ramon Magsaysay Memorial Medical Center (347 beds) at the University of the East, and Dr. Nicanor Reyes Sr. Medical Foundation (350 beds) at Far Eastern University.

Table 5.—Philippines: Number of government and private hospitals and beds, 1970 and 1979

	1970		1979	
	Hospitals	Beds	Hospitals	Beds
Government	208	13,375	481	46,088
Private	459	24,550	1,135	40,378
Total	667	37,925	1,616	86,466

Source: International Trade Administration, Market Research Division, international market research study.

Table 6.—Philippines: Profile of the health care sector, 1976 and 1979

	1976	1979
Private hospitals	690	1,135
Government hospitals	439	481
Total hospitals	1,129	1,616
General hospitals		1,381
Specialized medical institutions		
Government		15
Private	194	
Military hospitals		15
Clinical laboratories, private		12
Mobile clinics		50
Community hospital and health centers		88
Total number of beds	77,566	86,460
Physicians graduated	37,789	39,000
Available manpower (1977)		
Physicians (total)	16,123	
Physicians (private)	5,261	
Nurses	14,544	
Midwives	11,637	
Dentists	4,736	

Source: Philippine Hospital Association and Philippine Medical Association.

The Ministry has developed a hierarchy of services with a referral system to optimize the use of all health units at the lowest possible cost. Simple diseases are treated at the lowest level (Primary) and more difficult cases are referred to upper levels of the hierarchy. Five levels are defined in this referral system: Primary; Secondary; Tertiary-Provincial—with departments of surgery, pediatrics, general medicine, and obstetrics-gynecology, including ancillary services; Tertiary-Regional—all the departments listed above with the addition of anesthesia, orthopedics, laboratory, radiology, and EENT; and Tertiary-Medical Center—the additional departments of urology, psychiatry, neurology, and nuclear medicine plus teaching and training.

In 1970, there was one hospital bed for 1,000 population. By 1979, the bed-to-population ratio was 1:546. Sixty percent of the people are incapable of paying for medical service; they depend entirely on government facilities for hospital care. About 30 percent can make partial payment, and 10 percent can afford to pay full costs. Because of these conditions, private hospitals are usually half empty because they are competing for patients from the small private market, while government hospitals are typically jammed, with beds in the corridors.

The MOH has adopted the policy that highly sophisticated and expensive hospital equipment that is usually underutilized shall be shared among hospitals, whether private or government; $268,097 was budgeted for 1981 to pay for indigent patients' use of such equipment owned by private hospitals.

The major problems affecting the health care sector are the lack of professional and medical workers in rural areas, the maldistribution of medical facilities, the pressure of administrative deficiencies, and the lack of public awareness and motivation. To help cope with these problems, $3.4 million was budgeted in 1980 for restructuring of the rural health units.

For hospital manpower, the 1980 budget allowed 7,350 positions for medical officers of all categories in the MOH; 5,620 were filled. The Ministry has had difficulty recruiting for a variety of reasons, foremost of which is the low pay scale. While no shortage of doctors, nurses, and technicians is expected over the next 5 years or longer, continuing maldistribution will lead to shortages in rural areas. In fact, many of the doctors, nurses, and technicians being produced by the country's educational institutions will not be absorbed in the economy and will continue to seek better paying employment abroad.

The Philippine Medical Care Commission, another government agency, has recently provided the public with a comprehensive health insurance scheme, largely patterned after that of the United States. The Medicare Program has benefited hospitals, physicians, and patients. It has provided infrastructure, health facilities, and medical services to depressed and unreached areas. It increased the number of hospitals and hospital beds by more than 100 percent between 1972 and 1980. It was also responsible for strengthening and upgrading hospital equipment and vehicles and the standardization of hospital operations.

The health care delivery system is expected to evolve along the lines charted by its recent path. The Plan for the 1978-2000 period calls for the provision of 23,000 more beds; rural health units with two to three beds to serve municipalities with 5,000 to 50,000 population; municipal hospitals with 25 to 50 beds to serve populations of 25,000 to 50,000; provincial/general hospitals with 50 to 100 beds to serve populations of 50,000 to 250,000; and regional hospitals with 150 to 200 beds in certain areas.

Government hospital construction is directed toward rehabilitation, upgrading, and completion of selected on-going programs. In 1980, some $1 million was budgeted for construction of new hospitals, $2.7 million for construction of regional hospitals, and $3.9 million for improvement of hospitals and sanitaria. Of the 257 rural health units programed for assistance by the World Bank, 162 have been completed and 45 more are about to be started.

UP-PGH will eventually be replaced by the Philippine Medical Center which is envisioned as the apex of the national health care delivery system. It will provide sophisticated facilities, advanced design concepts, and services of highly skilled professionals.

The biggest of all proposed projects is the Philippine Medical Center which will be located at the University of the Philippines campus in Diliman, Quezon City, replacing the UP-PGH. It is expected to become the foremost medical institution in the country, serving as a primary service, teaching, and research institution. The Center will have a complex of 16 buildings, with most buildings devoted to particular medical specialties, for example, the Philippine Eye Research Institute. The complex will eventually house 1,000 beds. The total project cost is currently set at $385 million to be spent over a 10-year period. Germany, France, and Belgium have all expressed interest in financing the Center. This is an important project because it would affect the brands of equipment used by the Government's four other medical centers, 12 regional hospitals, and 61 provincial hospitals in future years.

Several other major projects are under consideration. The National Cancer Control Center of the Philippines, including all installed equipment, is expected to cost a total of about $24 million. A new National Lung Center will have a four-story building with 500 beds and will treat all types of lung diseases and disorders except tuberculosis. The estimated project cost should total $4 million.

The First Lady also has plans for the establishment of a Brain Center. These plans are still on the drawing board and are not expected to have any concrete shape until after 1985. Manila Mayor Ramon Bagatsing recently announced plans to establish a medical school for poor but deserving students in Manila and a $4 million, 100-bed hospital in the Sampaloc District of the city for charity patients. Initial appropriations for the latter program of $804,290 were included in the 1981 city budget.

Marketing Practices

Medical equipment is normally sold through importing national distributors representing partial to complete lines of medical and laboratory equipment and supplies. Complete line distributors maintain a sales force of 6 to 40 sales representatives, and all distributors sell directly to end users throughout the country. The sales force is usually divided by product lines in Metro Manila because of the size of this market, while provincial sales representatives are divided by geographic area and represent the company's full line of products. Distributors usually expect to make 40 to 60 percent gross margin on sales, based on the landed cost of goods sold.

Distributors all have their service departments, with two to eight service technicians. Technicians are often sent abroad for training at the supplier's factory. Service capability is probably the most important competitive weapon.

Price is a very important consideration in view of the limited purchasing power of the country and the severe cost squeezes on hospitals brought about by inflation. The Japanese have been able to compete heavily on the basis of price in combination with technologically advanced products. The price factor can still be overcome, however, by a product superior in technology and/or durability.

Payment is usually cash or 30- to 90-day terms. However, extension of credit on the part of suppliers is an important consideration in the purchase decision, particularly for big ticket sales.

Trade Regulations

The same ad valorem tariff duties on medical equipment are imposed on products coming from all countries exporting to the Philippines. Ad valorem rates are based on the Brussels Trade Nomenclature. For rates currently imposed on medical equipment see table 7.

Nontariff barriers are virtually nonexistent, except for possible delays due to availability of foreign exchange from time to time. The Central Bank requires distributors to file appropriate forms with them for single purchases in excess of $50,000, mainly for purpose of information.

All imports are subject to either an advance sales tax or a compensating tax. Advance sales taxes must be paid before the shipment is released by customs. The tax is 7 percent of 125 percent of the landed cost of goods, and is the tax rate imposed on medical equipment.

Companies registered with the Board of Investments (BOI) in selected industries considered important to the country's economic growth (e.g., mining, logging, iron, and steel) are exempted from paying tariff duties and taxes on imported equipment. Several of these companies maintain hospitals with up to 100 beds and are thus important prospects for medical equipment.

Table 7.—Philippines: Ad valorem tariffs currently imposed on imported medical equipment

Classification	Product description	Duty rate (percent)
90.17	Medical, dental, surgical and veterinary instruments and appliances (including electro-medical apparatus and opthalmic instruments)	10
90.18	Mechano-therapy appliances; massage apparatus; psychological aptitude-testing apparatus; artificial respiration, ozone therapy, etc.	20
90.20	X-ray apparatus	10
90.25	Instruments and apparatus for physical or chemical analysis; for measuring or checking viscosity, porosity, expansion, surface tension or the like; and for measuring heat, light, or sound; microtomes	10

Technical Standards

There are no national standards for electronic medical equipment, but imported equipment is expected to comply with standards existing in the country of origin.

Equipment sensitive to fluctuations in electric current may require continuous service. Voltages fluctuate from time to time in Metro Manila and vary widely in the provinces. Ever since the beginning of the energy crisis in 1973-74, brown-outs have been rather frequent and take place two to four times a day. The Bataan Nuclear Power Plant which can supply Manila with electric current will become operational in 1984-85. Standard voltage is 220 volts.

Temperature change may be a problem for some types of equipment. Most hospitals have room air conditioners rather than a central system. Equipment sensitive to temperature change should be accompanied by explicit instructions in large letters and placed on the equipment itself.

The Radiation Health Office (RHO) under the MOH was created by Presidential Decree No. 480 on June 6, 1974 to control the use of diagnostic X-ray units, high-energy machines, radioactive emitting apparatus, and ionizing radiation devices. Purchasers must register their equipment with RHO. All persons handling radioisotopes must be licensed by the Atomic Energy Commission.

According to the Current Imports and Commodity Classification Office of the Central Bank, the commodity classifications of the following items cannot be determined without the aid of brochures and other pertinent information which should be submitted upon importation:

Refrigeration units
Environmental tents
Single-use oxygen masks
Disposable flexible surgical lights
Surgical supplies
Fabrication materials, supplies, and equipment
Canes
Modification equipment for vehicles
Standing frames
Physical and occupational therapy equipment
Sensory aids and adaptive systems.

Most Salable Products

Cardiological Equipment
- Defibrillators
- Central station intensive care units
- Bedside intensive care systems
- Electrocardiographs

Pulmonary Apparatus
- Positive pressure breathing apparatus
- Volume controlled breathing apparatus
- Resuscitation equipment

Neurological Equipment
- Electroencephalographs

Pediatric Equipment
- Infant intensive care monitors

General Hospital Equipment
- Ultrasonic scanners
- Ultrasonic physiotherapy equipment
- Central station, patient monitoring systems
- Bedside patient monitoring systems

Operating Room Equipment
- Electrosurgical units, including electrocoagulation generators
- Anesthesia equipment

Clinical Laboratory Equipment
- Electrophoresis systems

Miscellaneous Health Care Equipment
- X-ray units for mass chest surveys
- Mammographic equipment (X-ray and thermographic)

Disposables
- Prepared trays
- Single-use oxygen masks
- Disposable thoracic catheters
- Disposable gastric feeding unit/bag
- Disposable otoscope specula
- Disposable scalpels
- Disposable monitoring electrodes

Physical and Occupational Therapy Equipment
- Traction devices
- Therapeutic exercise units
- Massage equipment

Additional Information

The project officer responsible for Country Market Surveys on Medical Equipment is:

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The Survey summarizes a 108-page International Market Research (IMR) report prepared by Modern Management Concepts and Systems, Inc. in Manila, Philippines, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in the Philippines and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
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information, making direct personal contact, and participating in medical equipment exhibits and technical seminars. Educating end-users and developing product awareness are key to maintaining the Korean market.

Nambuk Medical Instruments is the largest domestic producer of basic medical and surgical equipment, including hypodermic needles, forceps, uterine dilators, operating lamps, operating tables, sterilizing chambers, and stethoscopes. Other Korean medical equipment manufacturers produce X-ray devices, stethoscopes, and incubators using imported components. Some companies also have technical agreements to produce for the local market and for export. Korea Medical Supply exports transfusion sets made under license from KMS of Japan; Nakamura of Japan licenses Han-il Medical Instruments Co., Ltd., to make incubators and injection syringes. Akiyama of Japan licenses Ailee Co., Ltd., to make suture needles. Idea-Instrumentfabrik-Bechtold of Germany licenses Nambuk-Idea Medical Instruments Co. to produce surgical instruments. Fred Lin of the United States has a tie-up with Shinjin Rubber Co., Ltd., to produce surgical gloves. Other licensing agreements include Samsung Electronics with GE (United States), Daihan Electric Wire with Toshiba (Japan), Gold Star Co. with Hitachi and Shimadzu (Japan), and Keun Wha Pharmaceutical with G. D. Searle (United States). In addition, Doosan Industrial Co. has a joint venture with CGR of France to manufacture CT scanners, X-ray equipment, and film.

Table 2.—Korea: Imports of medical equipment by country of origin, 1979, 1980, and projected 1986

(in millions of U.S. dollars)

	1979	1980	1986
Medical/surgical, electromedical, diagnostic, ophthalmic apparatus (90.17)			
United States	10.8	10.2	30
Japan	8.8	10.5	
Germany	1.9	2.2	
All other	1.3	1.7	
Total	22.8	24.5	64
Mechanotherapy and respiratory appliances (90.18)			
United States	1.1	1.4	3
Japan	1.5	1.3	
Germany	.2	.3	
All other	.1	.1	
Total	2.9	3.2	7
Orthopedic, prosthetic appliances (90.19)			
United States	.8	1.5	3
Japan	.6	.4	
Germany	—	—	
All other	.3	.4	
Total	1.7	2.4	8
X-ray apparatus (90.20)			
United States	4.6	4.0	9
Japan	5.4	7.7	
Germany	2.0	3.5	
All other	2.6	4.2	
Total	14.6	19.4	47
Combined total			
United States	17.3	17.1	45
Japan	16.3	19.9	
Germany	4.1	6.0	
All other	4.3	6.4	
Grand total	42.1	49.4	126

Source: Statistical Yearbook of Foreign Trade (1979, 1980), Office of Administration, Republic of Korea.

Although Korean manufacturers receive government protection, domestic medical equipment generally does not compete with imported equipment, as the products differ in quality and technology. Korean firms typically lack the capitalization and high technology required to produce precision electronic goods, metal goods, or machinery items for medical equipment applications. However, the Fifth Five-Year Plan (1982-1986) allocates $11 million of government and private investment funds to electronic medical equipment production facilities to develop local industry.

Specific Product Markets

Cardiological equipment.—Eight Korean hospitals are currently equipped to perform open-heart surgery. Several cardiac output analyzers with computers are in use and purchases should continue as general hospitals and university medical centers expand their facilities to perform more technically advanced operations. Some teaching hospitals and university medical centers have facilities for implanting pacemakers, with the current rate of 25 to 30 operations per year expected to increase annually by 25 percent. Cardiac output analyzers with computers are currently supplied by U.S. firms such as Waters, Instrumentation Laboratory, B-D Medical Systems (now Datamedix), and American Edwards.

American-made defibrillators dominate the Korean market, with Hewlett-Packard, Spacelabs, Mennen Medical, Datamedix, Burdick, Birtcher, Datascope, and Physiocontrol the leaders. Bedside intensive care systems are supplied primarily by Japanese makers, who can arrange timely installation, testing, and training. Nihon-Kohden, Fukuda Denshi, and San Ei Instruments rank as major sources, with U.S. firms Hewlett-Packard, Spacelabs, Burdick, Electrodyne, and Mennen also participating.

Nearly all hospitals and clinics are equipped with electrocardiographs. Hewlett-Packard and Burdick have become popular suppliers; however, Japanese firms control more than 50 percent of the market, with particular strength in the small, private clinic sector where owners are sensitive to increased

Table 3.—Korea: Exports of medical equipment from the United States, 1978-82
(in thousands of U.S. dollars)

	1978	1979	1980	1981	1982	Percentage change 1978–82	Percentage change 1981–82
Medical instruments							
Pacemakers	9	121	141	536	850	9,344.44	58.58
Diathermy units	—	—	15	26	100		284.62
Ultrasonic therapeutic devices	41	116	178	97	145	253.66	49.48
Other therapeutic apparatus	855	469	809	1,263	1,368	60.00	8.31
Electrocardiographs	89	50	116	239	99	11.24	−58.57
Electroencephalographs	6	17	—	164	36	500.00	−78.04
Complete patient monitoring systems	1,744	416	635	1,740	1,016	−41.73	−41.60
Electromedical apparatus, NSPF	5,839	2,720	3,669	5,453	7,224	23.72	32.48
Electromedical apparatus parts	884	942	442	1,089	873	−1.23	−19.82
X-ray tubes	65	85	125	231	117	80.00	−49.34
Parts for X-ray tubes	8	26	56	21	42	425.00	100.00
X-ray apparatus & parts for medical or dental use	2,499	2,272	2,222	3,599	14,936	497.68	315.00
Radiological apparatus & parts for medical or dental use	534	380	161	621	239	−55.23	−61.50
Ophthalmic instruments & appliances & parts	242	396	231	281	411	69.83	46.26
Anesthetic apparatus & instr. & pts. (exc. syringes)	619	304	466	243	157	−74.63	−35.38
Bougies, catheters, drains, & soundes & parts	54	251	309	367	835	1,446.30	127.52
Basal metabolism & blood pressure apparatus, & parts	59	228	339	490	627	962.71	27.96
Hypodermic syringes, & parts	19	105	108	150	166	773.68	10.67
Other syringes, & parts, NSPF	15	33	38	45	300	1,900.00	566.67
Other medical, etc. instruments & apparatus, & parts, NSPF	4,237	2,004	2,336	2,742	5,319	25.54	93.98
Subtotal	17,820	10,932	12,396	19,399	34,860	−95.62	−79.70
Medical and hospital appliances and equipment							
Sterilizers & autoclaves & parts	1,818	783	774	1,904	3,206	76.35	68.38
Wheelchairs, & parts	72	41	51	13	223	209.72	1,615.38
Other hospital, medical, dental, etc. furniture, NSPF	599	1,365	851	835	1,389	131.89	66.3
Mechanotherapy appliances & massage apparatus, & parts	57	188	131	128	236	314.04	84.38
Artificial respiration, ozone, oxygen, aerosol therapy etc.[1]	615	548	1,130	—	—	—	—
Artificial respiration, NSPF	—	—	—	1,127	2,466		118.81
Hearing aids & parts, NSPF	4	37	18	76	62	1,450.00	−18.41
Bone & joint prosthesis, plates, screws, nails, etc.	338	665	719	842	1,311	287.87	55.70
Other orthopedic appliances	29	102	181	461	334	1,051.72	−27.54
Subtotal	3,532	3,730	3,855	5,386	9,227	161.24	71.31
Medical supplies							
Opacifying prep. for radiological exam.	114	86	123	91	159	39.47	74.7
Other diagnostic agents (exc. biological) NSPF	166	383	172	830	439	164.46	−47.10
Waddings, gauze, dressings, etc. w/medicinals	35	7	3	4	—	−99.99	−99.99
Other waddings etc. NSPF	129	31	17	14	38	−70.53	171.4
Surgical sutures & materials etc., sterile	305	209	135	223	250	−18.02	12.1
Surgical and medical gloves	8	8	38	1	44	450.00	4,300.00
Hypodermic needles	11	10	23	294	1,360	12,263.64	362.5
X-ray film, medical, exc. dental	77	282	795	36	42	−45.44	16.6
Other X-ray film	150	98	300	35	53	−64.66	51.4
Contact, ophthalmic lenses not mounted	2	—	—	—	—	−99.99	
Other ophthalmic lenses	140	311	118	209	141	0.71	−32.5

Table 6.—Korea: Hospital Association hospitals, by type

National university hospitals	5
National hospitals	9
Provincial hospitals	31
City and country hospitals	13
School hospitals	24
Other public hospitals	41
Total public hospitals	123
Company, association, and foundations hospitals	65
Private hospitals	138
Total private hospitals	203
Total	326

Source: Korea National Hospital Association.

Note: This table does not include medical and dental clinics, herbal hospitals and clinics, dispensaries, and health care centers.

hospitals are funded by philanthropic foundations and associations or by the owners from accumulated earnings. Health insurance payments provide an increasing percentage of major hospital revenues. The Fifth Five-Year Plan (1982-1986) to add 25,920 hospital beds anticipates funding for new hospitals construction to come from Japan's Overseas Economic Cooperation Funds (OECF) and will be allocated at $10,000 for each new bed constructed. The Ministry of Health and Social Affairs plans an additional W1,500,000 ($2,275) per bed of Korean funds for new hospital construction. Current budgetary constraints, however, will delay completion of these plans.

The Ministry of Health and Social Affairs has direct jurisdiction over 5 large central hospitals and 4 national hospitals. There are 5 university hospitals (see table 6). The Ministry of Home Affairs supervises 197 health care centers and 1,336 health care subcenters. However, the system is still burdened by uneven quality: excellence in the large population centers and lack of sophistication in the countryside. Of 326 city hospitals, 97 are in Seoul and 33 in Busan; 80 percent of medical employees work in urban areas, and 504 villages have no doctor at all. The Government is also concerned that the shortage of medical doctors (940 in 1982) will increase significantly (to 3,615 by 1985), despite the fact that 1 doctor will be available per 1,275 people as opposed to 1 per 1,485. However, even in 1978 an impressive array of board specialists were practicing in Korea (see table 7).

Table 7.—Korea: Distribution of medical specialists, 1978

General internal medicine	960
Neuropsychiatry	234
General surgery	1,410
Orthopedic surgery	451
Plastic surgery	42
Neurosurgery	209
Chest surgery	105
Anesthesis	186
Obstetrics and gynecology	1,027
Pediatrics	667
Ophthalmology	290
E.N.T.	418
Urology	254
X-ray	184
Pathology (clinic)	80
Pathology (anatomy)	94
Dermatology	204
Tuberculosis	131
Preventive medicine	283
Total	7,229

Source: Ministry of Health and Social Affairs.

The Ministry of Health and Social Affairs has announced plans to convert five national university hospitals and 34 municipal hospitals into public corporations to improve the financial status of public medical facilities, which currently meet only 20 percent of the nation's medical needs. Government will provide additional pay and incentives to induce medical personnel to work in rural health centers. Although 80 percent of Korea's medical needs have been met by the private sector, this sector is relatively unsophisticated, and includes mostly corner druggists, herbalists, and acupuncturists, but ranging up to doctors in private clinics. The bulk of the medical private sector is thus largely inaccessible to U.S. medical equipment suppliers and not a major purchaser of high-technology equipment. However, plans to renovate older hospitals and stimulate private-sector construction of hospitals through subsidized loans, tax exemptions, or reductions for importing medical equipment will stimulate demand for imports.

Seoul National University Hospital, traditionally Korea's largest and most prestigious medical institution, will continue under government control. The hospital ministers to Korea's political and economic elite and has no problem attracting top doctors. The hospital used close to $10 million in U.S. Export-Import Bank loan financing to import facilities including elevators, interphone systems, doctor/nurse call systems, closed-circuit TV therapy equipment, nuclear medical apparatus, and central laboratory equipment for its new 900,000 sq. ft. hospital building. The structure, which cost $24 million, is recognized as the largest building in Korea and the largest hospital in the Far East. It houses 1,056 patient beds with facilities for thousands of outpatients, hospital workers, and senior medical students.

Most university medical centers and general hospitals are computerizing their medical services administration. University medical centers have access to computers at the schools for general administrative work and patient monitoring systems. Additional computer power will be required to handle increased volume of claims and records under the national health insurance program.

Several large general hospital construction projects are currently underway or planned in Seoul. The Asan Foundation (a philanthropic organization associated with the Hyundai Group) Hospital—a 1,200-bed facility—is scheduled for completion in 1986. The Young Dong Severance Hospital, with 250 beds, and the Korea University Medical Center of Kuro-Dong, Yeongdungpo-Gu, also furnishing 250 beds, are two recent projects.

Marketing Practices

Distribution of imported medical equipment is generally made either directly from supplier to end-user or from supplier through a commission sales agent and registered trader to the end-user. Commission sales agents serve as key links between overseas suppliers and end users because of their sales promotion functions. Documentation for all import transactions other than government procurements and acquisitions in connection with foreign investment projects is handled by registered traders, who receive a small fee from end-users for this service.

For purchases by government agencies, the Office of Supply, Republic of Korea (OSROK), invites bids from interested foreign suppliers and negotiates terms on behalf of the various agencies, specifying the source of financing before bids are received. The role played by local commission sales agents as intermediaries in OSROK procurements has great importance. American, Japanese, and European suppliers station representatives in Korea to act as sales agents, although they cannot import directly.

The U.S. Trade Center in Seoul, located in the American Embassy, provides a facility where U.S. medical equipment manufacturers can exhibit their products or conduct sales and technical seminars. U.S. medical equipment makers arrange exhibits almost every month as separate companies or in industry groups to promote a single product category.

Trade Regulations

Under the 1983 Trade Plan, most medical equipment receives automatic approval for import. Article 34 of the Pharmaceutical Law, however, permits the Ministry of Health and Social Affairs to review and approve medical equipment imports, with the result that many are subject to prior approval. These items include: whole-body computed tomographic scanners, brain computed tomographic scanners, electrocardiographs, gamma scintillation cameras, ultrasonic diagnostic units, linear accelerators, automatic analyzers, and cobalt 60. All imported medical equipment costing more than $200,000 also must receive prior approval. Applications to import medical equipment that requires prior approval should be submitted to:

Chi Dal Hyun, Director-General
Bureau of Medical Affairs
77 Sejong-ro, Chongro-ku
Seoul, Republic of Korea
Telephone: 720-3723.

After receiving approval, agents or end-users open at-sight irrevocable letters of credit

Upon arrival, medical equipment is subject to 15-percent customs duty, 2.5-percent defense tax on the c.i.f. value, and 10-percent value-added tax. Charges for land transportation, warehouse storage, and installation apply as well.

Korea controls imports through various nontariff barriers such as allowing only licensed traders to import or export goods in their own names and the sometime restrictive prior approval requirements cited above. As Korean suppliers, generally in low-technology product categories, demonstrate the ability to manufacture domestically, an import ban or high tariff to permit unchallenged development is often established. Should such local products prove unsuccessful, end-users or foreign suppliers' agents may be able to get import barriers lifted.

Technical Standards

Certain medical equipment falling under BTN 9017 is subject to technical review and approval by the Korea Institute of Machinery and Metals (KIMM). KIMM requires the following documents:

- One copy of the manufacturer's final (ex-factory) acceptance/specifications.
- Two copies of a description of test standard and test methods employed for the medical equipment. The importer prepares this based on the manufacturer's specifications.
- One copy of the supplier's product catalog.

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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The Survey summarizes a 45-page research report prepared by Peat, Marwick, Mitchell & Co., Seoul, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

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Table 1. — Hong Kong: The market[1] for computers and peripheral equipment, 1978-81 and 1986
(in thousands of U.S. dollars)

	1978	1979	1980	1981	1986
Minicomputers					
Production	–	–	–	–	3,000
Imports	2,600	6,877	4,448	5,594	16,500
Exports	100	279	225	315	3,400
Market size	2,500	6,598	4,223	5,279	16,100
Small, medium, and large computer systems					
Production	–	–	–	–	–
Imports	58,899	53,521	81,963	85,779	116,600
Exports	176	905	1,425	1,801	6,200
Market size	58,723	52,616	80,538	83,978	110,400
Peripherals (sold separately)[2]					
Production	2,400	3,200	1,700	1,100	4,700
Imports	5,671	16,468	30,578	39,751	147,600
Exports	741	2,317	6,473	9,710	29,600
Market size	7,330	17,351	25,805	31,141	122,700
Data communications equipment (sold separately)[2]					
Production	–	–	–	–	–
Imports	500	1,173	1,538	2,000	7,400
Exports	–	–	–	–	–
Market size	500	1,173	1,538	2,000	7,400
Totals					
Production	2,400	3,200	1,700	1,100	7,700
Imports	67,670	78,039	118,527	133,124	288,100
Exports	1,017	3,501	8,123	11,826	39,200
Market size	69,053	77,738	112,104	122,398	256,600

[1] Size of market equals production (ex factory value) plus imports (c.i.f.) minus exports (f.o.b.). Figures include leased equipment counted at its market value as if sold outright in the initial year of lease. Parts are not included.

[2] Excluding equipment sold as components of integrated computer systems.

Source: International Trade Administration, Office of Trade Information Services research report, "The Market for Computers and Related Equipment in Hong Kong" (see Additional Information box). Figures in this report are based on data gathered in Hong Kong, including available government statistics, industry reports, and trade source estimates and projections.

textile and clothing industry, faced with quotas in buying countries, strives to produce profitable high-quality items. The retail and wholesale trade is characterized by narrow profit margins, rapid turnover of stock, and scarcity of storage space—all of which are projected to encourage rapid computerization over the 1981-86 period. Analysts foresee extensive use of automated inventory control and ordering systems, point-of-sale (POS) terminals, and electronic funds transfer (EFT) services. Miscellaneous specialized small businesses, which made about 7.5 percent of computer purchases in 1980, are forecast to expand their share to almost 13 percent by 1986.

Other prominent buyers of computers and related equipment include Government, the transportation industry, and utilities. Hong Kong's Government is computerizing immigration records and plans to increase its use of data base management systems (DBMS), telecommunications, distributed networks, and key-to-disk data entry systems. The Urban Council, or local government, is developing systems for basic data processing and on-line ticket sales. In the transportation sector, the major airline has one of the largest installations in Hong Kong, and shipping companies use computers to communicate with overseas offices and to manage container depots. However, analysts see untapped potential in bus companies, railway systems, ferry companies, tramways, and taxi fleets. Utilities have already installed computers and expect to restrict their future purchases to replacements, upgrades, and occasional new products, such as optical character readers (OCR's), graphic displays, and key-to-disk data entry devices. Projections show utilities increasing their use of teleprocessing, which will prompt corresponding purchases of concentrators and communications controllers.

Major Market Trends

Business and commercial data processing dominate computer use in Hong Kong, accounting for over 75 percent of minicomputer installations and at least 60 percent of small, medium, and large computer time in 1980 (see tables 7 and 8). However, other applications are becoming significant for larger computers. As smaller systems take over more business and commercial processing, large mainframes will increasingly be used to control data communications. Industry analysts expect growing use of small- and medium-sized systems for industrial control and education, as well as for data communications.

Storage.—Disk and diskette drives are the most popular storage devices among Hong Kong electronic data processing (EDP) managers, although magnetic

Table 2. — Hong Kong: Imports of computers and peripheral equipment[1] by country of origin, 1979-81 and 1986

	1979		1980		1981		1986	
	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)	Value ($ thousands)	Import market share (%)
Minicomputers								
United States	6,239	90.7	3,815	85.8	4,476	80.0	11,500	70.0
Japan	54	0.8	166	3.7	547	9.8		
Germany	496	7.2	38	0.9	541	9.7		
United Kingdom	88	1.3	50	1.1	30	0.5		
France	–	–	60	1.3	–	–		
Other	–	–	319	7.2	–	–		
Subtotal	6,877	100.0	4,448	100.0	5,594	100.0	16,500	100.0
Small, medium, and large computer systems								
United States	45,215	84.5	66,511	81.1	68,623	80.0	93,280	80.0
United Kingdom	7,490	13.9	15,214	18.6	16,041	18.7		
Japan	–	–	238	0.3	858	1.0		
Germany	306	0.6	–	–	257	0.3		
Other	510	1.0	–	–	–	–		
Subtotal	53,521	100.0	81,963	100.0	85,779	100.0	116,600	100.0
Peripherals (imported separately)[2]								
United States	7,541	45.8	15,816	51.7	19,876	50.0	73,800	50.0
Japan	1,972	11.9	5,401	17.7	7,036	17.7		
United Kingdom	2,843	17.3	1,876	6.1	2,425	6.1		
Germany	262	1.6	790	2.6	1,034	2.6		
France	191	1.2	239	0.8	318	0.8		
Other	3,659	22.2	6,456	21.1	9,062	22.8		
Subtotal	16,468	100.0	30,578	100.0	39,751	100.0	147,600	100.0
Data communications equipment (imported separately)[2]								
United States	877	74.8	1,154	75.0	1,500	75.0	5,550	75.0
Other	296	25.2	384	25.0	500	25.0		
Subtotal	1,173	100.0	1,538	100.0	2,000	100.0	7,400	100.0
Total imports	78,039		118,527		133,124		288,100	
Total imports from U.S.	59,872		87,296		94,475		184,130	
U.S. share of total imports		76.7		73.7		71.0		63.9

[1] Figures include leased equipment counted at its import (c.i.f.) value as if sold outright in the initial year of the lease. Parts are not included.

[2] Excluding equipment imported as components of integrated computer systems.

Source: See source notation of table 1.

Table 3. — Hong Kong: Population of computers, by size,[1] 1980 and 1986

	1980		1986	
	Number of units	Percent of total	Number of units	Percent of total
Minicomputers	412	57.1	1,973	61.4
Small computers	168	23.3	779	24.2
Medium computers	98	13.6	402	12.5
Large computers	43	6.0	60	1.9
Total	721	100.0	3,214	100.0

[1] Computer size is based on the purchase price of the CPU, as follows: minicomputers, less than $100,000; small computers, $100,000-$250,000; medium computers, 251,000-$999,999; and large computers, $1,000,000 or more.

Source: See source notation of table 1.

tape drives (conventional as well as cassette and cartridge) continue to show steady growth. Trade sources predict that many users will be turning to supplementary storage. Most purchases are expected to consist of additional disk drives or external semiconductor memory, including metal-oxide semiconductors (MOS) and charge-coupled devices

Table 4. — Hong Kong: Expenditures[1] for computers and peripheral equipment by major user sectors, 1980 and 1986

	1980		1986	
	Value ($ thousands)	Percent of total	Value ($ thousands)	Percent of total
Government	13,529	12.1	26,000	10.1
Manufacturing	6,131	5.5	20,100	7.8
Banking and finance	43,419	38.7	82,400	32.1
Insurance	3,309	3.0	8,800	3.4
Retailing and wholesaling	5,959	5.3	21,400	8.3
Transportation	10,612	9.5	22,900	8.9
Utilities	10,661	9.5	21,700	8.5
Communications	395	0.4	1,400	0.6
Health care	40	–	200	0.1
Education and research institutions	500	0.4	1,500	0.6
Publishing and printing	60	0.1	200	0.1
EDP service bureaus	9,020	8.0	16,900	6.6
Other	8,469	7.5	33,100	12.9
Total	112,104	100.0	256,600	100.0

[1] Excluding cost of software, hardware maintenance, sales commissions, etc.

Source: See source notation of table 1.

Table 5. — Hong Kong: Cumulative number and value[1] of installed computers,[2] by major user sectors, as of December 31, 1980

	Minicomputers		Small computers		Medium computers		Large computers	
	Number of units	Value ($ millions)	Number of units	Value ($ millions)	Number of units	Value ($ millions)	Number of units	Value ($ millions)
Government	14	0.6	9	1.1	4	2.4	5	17.5
Manufacturing	71	3.9	27	4.0	10	3.5	3	4.5
Banking and finance	39	2.0	26	3.7	20	9.4	13	69.3
Insurance	11	0.5	4	0.6	1	0.3	1	1.7
Retailing and wholesaling	68	3.6	27	4.0	9	3.2	2	2.5
Transportation	21	0.8	13	2.0	14	5.7	3	15.0
Utilities	1	–	1	0.1	11	5.9	4	9.9
Communications	–	–	8	1.4	3	1.6	–	–
Health care	2	0.1	–	–	–	–	–	–
Education and research institutions	24	0.8	7	1.0	4	2.0	1	1.5
Publishing and printing	4	0.2	1	0.2	3	0.8	–	–
EDP service bureaus	19	1.0	13	1.9	8	2.9	10	33.3
Other	138	4.5	32	4.7	11	5.0	1	1.0
Total	412	18.0	168	24.7	98	42.7	43	156.2

[1] Value is based on original purchase price. Figures include leased equipment counted at its original list price as if sold outright.

[2] Computer size is based on the purchase price of the CPU, as follows: minicomputers, less than $100,000; small computers, $100,000-250,000; medium computers, $251,000-999,999; and large computers, $1,000,000 or more.

Source: See source notation of table 1.

Table 6. — Hong Kong: Total employment and number of establishments, by size,[1] in major EDP user sectors, 1981

	Total employment	Number of establishments		
		Large	Medium	Small
Government	118,949	1	N/A	N/A
Manufacturing	966,931	40	9,890	34,817
Banking and finance[2]	133,275	4	668	9,787
Insurance	6,991	–	210	519
Retailing and wholesaling	455,752	6	3,151	70,917
Transportation[3]	62,342	8	2,817	
Utilities	9,782	4	–	–
Communications[3]	16,851	2	48	
Health care[4]	17,990	4	32	–
Education and research institutions	57,396	3	2,500	–
Publishing and printing	28,227	–	800	1,900
EDP service bureaus	1,469	–	2	109

[1] Size of establishment is based on number of employees, as follows: large establishments, 1,000 or more; medium, 20 to 999; and small, fewer than 20.

[2] Data include real estate, legal, accounting, engineering, architectural, advertising, and business services.

[3] For Transportation and Communication establishments, data were available for only total employment and a number of large establishments.

[4] For health care establishments, the breakdown is by number of beds.

Source: See source notation of table 1.

Table 7. — Hong Kong: Percentage breakdown of total installed minicomputers[1] by end-user applications, 1980

		Percent of total
Business/commercial data processing		76.8
Industrial control		12.7
Continuous process control	0.3	
Direct machine control	0.9	
Factory management	9.7	
Other	1.8	
Data communications		5.3
Terminal controllers	3.7	
Front end systems	1.2	
Message circuit switching	0.1	
Data concentrators	0.3	
Laboratory analysis		3.6
Medical sciences	–	
Other life sciences	0.6	
Physical sciences	3.0	
Other		1.6
Total		100.0

[1] Minicomputers are defined as those having a CPU priced at under $100,000.00.

Source: See source notation of table 1.

(CCD). The popularity of extended core memory is declining. Automated mass storage systems are not currently used in Hong Kong.

Data entry.—On-line data entry via terminals now dominates computer input. Users prefer on-line entry because it allows verification of data at the source, cuts down on labor requirements, and lets input devices double as output media. Key-to-diskette entry is used primarily for its efficiency in high-volume batch processing. The few users still employing punched cards are gradually phasing them out. Techniques which are expected to become more prevalent by 1986 include on-line methods, OCR input, bar code and POS devices, credit card readers, and remote job entry equipment. The transportation sector is considering adoption of OCR in ticketing systems and installation of terminals for on-line data capture. Key-to-disk data entry systems are increasingly popular for Government data processing, while utilities are expected to step up their use of OCR input. Some users may also purchase voice recognition devices. CRT terminals capable of inputting Chinese language characters are expected to find a ready market.

Table 8. — Hong Kong: Percentage breakdown of total processing time of installed small, medium, and large computers[1] by end-user application, 1980

	Small computers	Medium computers	Large computers
Business/commercial data processing	72.3	66.7	63.3
Industrial automation/process control	8.4	7.5	11.6
Scientific/engineering applications	0.7	4.0	3.1
Military/aerospace applications	–	1.0	–
Data communications/teleprocessing	13.5	14.0	19.2
Medical/scientific lab analysis	0.6	0.2	0.5
Education, instruction	3.9	2.4	2.3
Other	0.6	4.2	–
Total	100.0	100.0	100.0

[1] Computer size is based on the purchase price of the CPU, as follows: small computers, $100,000-$250,000; medium computers, $251,000-$999,999; and large computers, $1,000,000 or more.

Source: See source notation of table 1.

Output.—CRT-equipped keyboards and other POS terminals offering both input and output capability are expected to experience growing use. Financial institutions plan to buy more cash dispensers and teller terminals, utilities hope to install graphic output displays, and the transportation sector will have more tickets written by computer. Again, Hong Kong computer users are eager to buy output displays and printers capable of presenting Chinese language characters. Trade sources forecast good sales potential for high-speed nonimpact printers, graphic displays, digital plotters, printer/plotters, and CRT displays.

Teleprocessing/data communications.—Almost all computer users in Hong Kong expect teleprocessing to become more common in the future. Transmission costs are not significant because the Colony is geographically compact. Furthermore, rising rents are encouraging organizations to disperse some of their business activities to lower-rent areas, increasing the need for efficient interoffice exchanges of information. Moreover, trade sources foresee growing use of teleprocessing to foreign locations. Because of its role as a regional financial and commercial center, Hong Kong must maintain close contact with other areas in Southeast Asia, particularly Malaysia and Singapore. The only factor cited by industry observers as a potential impediment to the growth of teleprocessing is a shortage of programmers to develop telecommunications software.

The two common carriers responsible for data communications facilities are Cable and Wireless, which handles international telecommunications, and the Hong Kong Telephone Company, which provides local connections. Other networks for specific industries—notably the financial sector's Society for Worldwide Interbank Financial Telecommunications (SWIFT) and the airlines' Societe Internationale de Telecommunications Aeronautiques (SITA)—operate through facilities of the common carriers. Hong Kong Telephone provides about 65 percent of data transmission services, primarily through private leased circuits. About 5,000 of the 40,000 private leased lines in Hong Kong transmit data, and banks account for over 80 percent of data transmission facilities in use. Speeds on the private networks range from 300-1,200 baud asynchronous and 1,200-4,800 baud synchronous. Planned improvements include point-to-point data links offering speeds of 19,200 bits per second for distances up to 10 kilometers.

In addition to providing international telephone and telegraph service, Cable and Wireless offers telex service (about 10,000 subscribers in 1979) and a variety of data communications facilities Message switching (terminal-to-terminal transmission of complete messages over leased circuits) at speeds from 50 to 1,200 baud is available on nearly 2,300 circuits, 1,950 of which were in use by March 1982. Anticipated future improvements to the message switching system include higher line speeds, multiple-address message support, and support of additional protocols such as International Telephone and Telegraph Consultative Committee's (CCITT's) X.25, high-level data link control (HDLC), and the emulation of IBM 3270 and 2780 terminals.

Private networks can be developed through leased circuits. In 1982, some 370 subscribers had access to 1,600 available circuits offering speeds up to 9,600 baud, including circuits to three PRC cities—Guangzhou, Shanghai, and Beijing. An 80 percent increase in the use of private networks is expected through the mid-1980's. Other services available through Cable and Wireless include the international public switched data transmission network (DATEL), which has about 100 users in Hong Kong; access to large U.S. and Canadian data bases through the TYMNET and TELENET networks; and a telecopying service for transmission of facsimile documents (particularly popular for exchanging messages with Japan). Packet switched transmission with speeds of up to 9,600 baud is expected to be available in Hong Kong by 1983.

Distributed versus centralized processing.—Computer users in Hong Kong express mixed views about the decentralization of EDP. About half of them think that future operations will be more widely dispersed; the other half foresee a centralized approach, primarily because of data management problems and the shortage of adequately trained computer personnel. Most observers agree, however, that data entry is likely to become more decentralized.

Small business computers.—Only a few small business systems are currently in use, but trade sources believe the population of potential buyers (firms with annual turnovers of $3 million to $7 million) numbers over 4,400. Many of these companies are expected to enter the market as a result of the Hong Kong business community's growing awareness of the advantages of computerization. Competitive pressures, falling hardware costs, and the availability of packaged software are also expected to help boost sales of small business systems to a projected $16 million by 1986. U.S. vendors still dominate this market, but they face growing pressure from Japanese firms (Hitachi, NEC, Sharp, Fujitsu, Mitsubishi, Casio) and European suppliers (Philips of Holland and its Swedish subsidiary; Nixdorf of Germany; International Computers, Limited (ICL) of the U.K.).

Automated business transaction information systems.—Hong Kong's busy travel industry leads the way in use of automated transaction systems. Airline reservations and tickets are handled by computers, and on-line ticketing systems are to be introduced by the Urban Council and by a ferry company operating to Macao. Hotels, too, are starting to computerize their reservations. POS terminals have made little headway in food retailing, although the sector is expected to begin using them by 1986. In manufacturing, transaction-oriented systems for inventory control, scheduling, and cost control have only limited use.

Automated banking systems.—The thriving financial sector in Hong Kong is counting heavily on automated banking to solidify its position as a world money center. Large corporations provide banks with computer tapes so that payroll funds can be transferred to employee accounts, and some companies (especially utilities) let customers make payments using EFT. ATM's, mostly wall models in or outside banks, have proved immensely popular in Hong Kong since their introduction in 1980. Trade sources believe that between 400 and 500 ATM's having a value of $16-$20 million were installed by the end of 1982. Bankers like ATM's because they reduce the labor required to process many small transactions. Customers use them to get cash for shopping in the many stores that remain open past normal banking hours. A Hong Kong bank claims to have one of the busiest ATM networks in the world, handling 1.5 million transactions and dispensing more than $100 million a month. All of the ATM's now operate on-line, with a front-end processor to keep the system working when the mainframe goes down. Trade sources foresee banks demanding varying levels of sophistication in the future, but for now the emphasis is on fast, basic service: ATM transactions are said to average only 30 seconds.

Industry analysts also predict that banks will provide customers with direct access to their accounts in the future. Some banks have already connected terminals in customers' offices to the bank's CPU on an experimental basis.

Computerized photocomposition systems.—Use of computers in Hong Kong's publishing industry is hampered by typically small scale production. Moreover, few computerized photocomposition systems are designed to set Chinese characters—a must if such technology is to be adopted.

Medical information systems.—Computerization of any sort has been virtually absent from hospitals in Hong Kong. Computerized medical information systems are almost unknown. Even patient administration, medical records, stock control, maintenance scheduling, and other routine tasks are preformed manually.

Software and data base management systems.—Systems software is most often provided by the hardware vendor. Applications programs, on the other hand, are usually custom produced. Suppliers of smaller systems may contract out development of a custom program that will be sold to the end-user as part of a turnkey system. Larger computer users tend to produce software in-house, buying from outside vendors only when a specialist's help is required or when peak workloads cause personnel shortages. Popular programming languages include Cobol, Basic, Fortran, and Assembler. According to trade sources, sales of software packages are hampered by the potential buyer's lack of information and by the need to modify many programs developed overseas before they can serve Hong Kong computer users.

Though many larger computer users have expressed interest in their use, DBMS packages are still rare in Hong Kong. EDP managers recognize the potential benefits of DBMS, but they often lack the staff needed to evaluate and implement such a system. Those DBMS packages that are in use are primarily the IMS and DL/1 systems sold by IBM. However, the independent U.S. supplier, Cincom, has begun to market its TOTAL package as a DBMS for mini's and mainframe-based systems.

EDP personnel.—Hong Kong's computer workforce of some 7,500 persons in 1980 comprised equal numbers of executive and supervisory personnel, development staff, operations level workers, and data entry employees. About 640 vacancies existed, and industry specialists expect the total number of positions to expand around 25 percent a year. Given the limited computer training available locally, projections indicate that over 5,500 computer jobs could remain unfilled between 1982 and 1986. Most computer science training is provided by Hong Kong Polytechnic, which graduated about 120 students in 1982. Hong Kong University and the Chinese University of Hong Kong also offer computer science programs, but these institutions do not yet produce many graduates. In addition, the Hong Kong Productivity Center gives a number of specialized computer courses, and the Baptist College and Lee Wai Lee Technical Institute are starting to offer computer training. Training abroad is unlikely to ease the storage of qualified personnel, since employers often find overseas curriculums irrelevant to local needs.

Systems acquisition.—Computer users in Hong Kong generally prefer purchase over renting or leasing. High interest rates have prompted some renters to switch to purchase. Also, many vendors of minicomputers and peripherals do not provide renting or leasing programs. However, renting is considered to offer maximum flexibility for a growing computer installation. It also provides a hedge against technological obsolescence and potential problems with untested equipment. To get the benefits of both methods of acquisition, some of Hong Kong's larger computer users follow a policy of leasing or renting the CPU and purchasing peripherals.

EDP managers are about evenly divided in their preference for single-sourcing or reliance on multiple vendors to meet equipment needs. Beginning computer users often select single-source acquisition for ease of operation, maintenance support, and equipment compatibility. Multisourcing, on the other hand, allows selection of specific pieces of specialized equipment offering better price-performance ratios. Many customers rely on one source for most of their hardware and for systems software, but turn to other suppliers when the original vendor cannot provide hardware or software for specific applications.

Competitive Environment

Established ties between U.S. vendors and their customers, coupled with the broad range of reliable hardware offered, should mean continued American dominance of the Hong Kong market. However, stiff competition form third-country rivals is expected to trim the U.S. share of imports from 71 percent in 1981 to about 64 percent by 1986. Local production is currently minimal. Despite a projected sevenfold increase in Hong Kong's computer output over the 1981-86 period, domestic firms are unlikely to become a major force in the market.

American manufacturers accounted for $199.6 million of the $241.6 total value of the computer base installed at the end of 1980. From $94 million in 1981, U.S. sales are forecast to expand a brisk 14 percent per annum over the 1981-86 period. Prominent American vendors, accounting for over 70 percent of the computer population, include IBM, Univac, NCR, and Digital Equipment (see table 9). U.S. suppliers holding a substantial 2 to 2.5 percent each of the installed computer base include Burroughs (mini's through medium-sized systems), Wang (mini-computers), Datapoint (mostly mini's and small systems), and Data General (mini's through medium-sized systems). A significant decline in the U.S. share is expected only for minicomputers, where intensive European and Japanese selling had already cut the American portion of imports from 90 percent in 1979 to 80 percent in 1981. American firms are forecast tc capture some 70 percent ($11.5 million) of minicomputer imports in 1986.

Table 9. — Hong Kong: Cumulative number and value[1] *of installed computers, by major suppliers, as of December 31, 1980*

	Number of units	Value ($ millions)	Share of total value (%)
IBM	117	107.2	44.4
Univac	27	34.1	14.1
ICL (UK)	29	28.5	11.8
NCR	97	15.2	6.3
DEC	80	14.5	6.0
Data General	52	5.8	2.4
Datapoint	63	5.8	2.4
WANG	95	5.6	2.3
Burroughs	44	5.1	2.1
Hewlett Packard	25	3.4	1.4
Fujitsu/Hitachi, NEC/Toshiba, Mitsubishi/Oki, NEAC	13	3.0	1.2
CDC	2	1.7	0.7
Nixdorf (Germany)	21	1.4	0.6
Philips (Netherlands)	1	1.0	0.4
GEC (UK)	1	0.6	0.3
ISC	1	0.5	0.2
Computer Automation Inc.	1	0.5	0.2
Honeywell	8	0.2	0.1
Others	43	7.5	3.1
Total	721	241.6	100.0

[1] Value is based on original purchase price. Figures include leased equipmen counted at its original list price as if sold outright.

Source: See source notation of table 1.

Third-country competition comes primarily fron Japan, the United Kingdom, and Germany. Shipment from the United Kingdom provided some 14 percen ($18.5 million) of Hong Kong's computer imports ir 1981. Britain's ICL accounted for almost 12 percen of the computer population by value with 2 installations at the end of 1980. Most of the IC machines are medium- to large-scale computers, bu the firm has redirected its marketing emphasis tc smaller mainframes and mini's. Local computer user generally give U.K.-built equipment good marks fo its price-performance ratio, reliability, and serviceability, and poor marks on product exposure software support, and parts availability.

Japanese companies such as Hitachi and NEC sel mostly minicomputers and small systems, thoug Hitachi has recently begun marketing medium-size mainframes. In addition to capturing about 10 percen of minicomputer imports in 1981, Japanese firms hav expanded their share of peripherals (imported separately) from 12 percent in 1979 to nearly 18 percent i 1981. They are in the forefront in developing printer and displays suitable for Chinese character output.

German suppliers have their biggest successes i the market for small business computers. By the en of 1980, Nixdorf had sold 21 units with a value o $1.4 million. Sales of German minicomputers in 198 amounted to $541,000, or nearly 10 percent of imports. Hong Kong users praise German-built equipment for its reliability, serviceability, and for the vendor's service support.

Domestic production of computers amounted to just $1.1 million worth of peripherals in 1981, but a number of companies are showing interest in manufacturing equipment locally. System International, a joint venture between the Hong Kong-based Feoso International Systems and an American group, expects to begin building a wide range of minicomputers and peripherals in its Hong Kong plant soon. By 1986, domestic output is projected at $7.7 million worth of minicomputers and peripherals.

Additional Information

The project officers responsible for Country Market Surveys on Computers and Peripheral Equipment are:

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The Survey summarizes a 66-page International Market Research (IMR) report prepared by Peat, Marwick, Mitchell & Co. in Hong Kong under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees in Hong Kong and not those of the Department of Commerce. The IMR report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications.

For a list, order form, and price information on all Country Market Surveys and selected International Market Research reports, including the one described above, contact:

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AT URBANA-CHAMPAIGN

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ternational Trade Administration

The domestic market for medical equipment and supplies in Hong Kong reached some $18 million[1] in 1982, and is expected to grow at an average annual rate of over 5 percent through 1986 (see table 1). This forecast is based on several projections covering this period, including a 12-percent increase in the supply of doctors, a 15-percent expansion in the hospital bed count, a 37-percent rise in the number of nurses, a 1.5-percent per annum growth in population, as well as upgrading of existing facilities and the equipping of new hospitals on a more elaborate scale than previously.

U.S. manufacturers are already well established and respected in market segments with the greatest growth potential, including diagnostic aids such as ultrasound and X-ray equipment, intensive care monitoring systems, and renal equipment. Clinical laboratories are also being expanded.

The public sector very much dominates the market for major equipment, with 90 percent of Hong Kong's hospital beds under direct or indirect government control. Growth of the market is therefore largely keyed to government expenditures. Four new government hospitals are planned for the late 1980's, in addition to the recently completed Prince of Wales at Shatin. Substantial extensions to three existing government hospitals are also underway.

Competitive Assessment

Nearly all medical equipment purchased by Hong Kong end-users is supplied by foreign manufacturers. Although Hong Kong is a major source of electronic and other sophisticated products, the only medical equipment made there are basic items such as beds and trolleys, which are not included in this study, and orthopedic equipment—principally artificial limbs. This is not expected to change before 1986.

Medical equipment imports are approximately twice as large as actual domestic consumption. This is due to substantial reexport trade, since Hong Kong has exceptionally good shipping facilities, a central location, and is a duty-free port. While imports amounted to $31 million in 1981 and $43 million in 1982, reexports totaled $14 million and $25 million respectively for those years.

U.S. manufacturers are a major force in the Hong Kong marketplace, accounting for over 45 percent of total imports (see table 2). American companies generally enjoy a good reputation for product technology and technical support, although prices are sometimes considered high, particularly on an initial-cost-only basis.

Table 1.—Hong Kong: Domestic production, imports, exports, and apparent domestic consumption of medical equipment, 1980-1982

(in thousands of U.S. dollars)

	1980	1981	1982
Medical/surgical, veterinary, ophthalmic instruments and electromedical, apparatus			
Domestic production	400	600	1,000
Imports	17,443	20,267	32,637
Exports	259	429	648
Reexports	8,680	11,725	22,509
Domestic consumption	8,904	8,713	10,480
Mechanotherapy and respiratory appliances			
Domestic production	—	—	—
Imports	1,003	868	1,587
Exports	—	—	—
Reexports	131	332	498
Domestic consumption	872	536	1,089
Orthopedic appliances, prostheses, hearing aids			
Domestic production	1,300	2,100	1,200
Imports	2,650	3,022	1,874
Exports	871	1,620	596
Reexports	2,470	2,552	810
Domestic consumption	609	950	1,668
X-ray apparatus and apparatus based on radioactive substances, parts and accessories			
Domestic production	—	—	—
Imports	2,363	6,816	6,810
Exports	—	—	—
Reexports	897	971	1,555
Domestic consumption	1,466	5,845	5,255
Combined total			
Domestic production	1,700	2,700	2,200
Imports	23,459	30,973	42,908
Exports	1,130	2,049	1,244
Reexports	12,178	15,580	25,372
Domestic consumption	11,851	16,044	18,492

Source: International Trade Administration, Office of Trade Information Services research study, The Market for Medical Equipment—Hong Kong (see Additional Information box).

Among third-country suppliers, the Japanese are strong competitors, often because of a price or delivery-time advantage. Japanese technology is thought to be developing rapidly, posing a threat to the future U.S. market share. One specialty in which Japanese makers excel is fiberoptics. European makers produce goods that are generally less advanced than U.S. equipment and more expensive than Japanese alternatives. European service support is also less effective in most cases than either U.S. or Japanese efforts. While Hong Kong is a British colony, there appears to be no bias to buy English equipment, although personnel trained at Hong Kong University or in the United Kingdom may be more familiar with British products.

Specific Product Markets

Cardiological equipment.—Heart disease, the second-largest cause of death in Hong Kong, is

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[1] All values are given in U.S. dollars. Local currency is converted at the following exchange rates: US$1 = HK$4.9925 (1979), HK$4.9710 (1980), HK$5.566 (1981), and HK$6.07 (1982 and subsequent years). Values for years through 1982 are given in current dollars; values for 1982 and subsequent years are given in 1982 constant dollars.

Table 2.—Hong Kong: Imports of medical equipment by country of origin, 1979-1982
(in thousands of U.S. dollars)

	1979	1980	1981	1982
Medical/surgical, veterinary and ophthalmic instruments, and electromedical apparatus				
United States	6,092	6,761	10,081	17,929
Japan	3,837	4,779	4,302	4,925
United Kingdom	1,156	1,641	1,296	3,225
Germany	912	1,260	1,066	1,186
China	280	1,089	1,262	1,012
Netherlands	407	259	85	903
All other	1,028	1,654	2,175	3,457
Total	13,712	17,443	20,267	32,637
Mechanotherapy and respiratory appliances				
United States	179	384	498	511
United Kingdom	138	572	255	749
All other	67	46	115	327
Total	384	1,002	868	1,587
Orthopedic, prosthetic appliances, hearing aids				
United States	1,710	1,469	1,998	1,069
Japan	219	300	343	280
Netherlands	425	68	86	83
Denmark	151	56	46	46
All other	664	757	549	396
Total	3,169	2,650	3,022	1,874
X-ray apparatus; parts and accessories for X-ray and electromedical equipment				
United States	428	449	4,760	1,376
Japan	466	643	1,005	1,065
United Kingdom	129	459	353	324
France	690	420	184	240
Germany	170	187	247	1,681
Netherlands	306	46	87	1,654
All other	187	159	180	470
Total	2,376	2,363	6,816	6,810
Invalid carriages				
United States	30	11	33	14
China	64	106	135	146
Taiwan	47	67	56	55
All other	50	46	40	114
Total	191	230	264	329
Combined total				
United States	8,439	9,074	17,370	20,899
All other	11,393	14,564	13,867	22,338
Total	19,832	23,638	31,237	43,237

Source: *Hong Kong Trade Statistics*, Census and Statistics Department, Hong Kong.

increasing—a trend that may be influenced by the growing proportion of older people in the population. Thus, cardiology is an expanding field. A special cardiac unit has been added in the new extension to Queen Elizabeth Hospital.

American makers have been supplying about 45-55 percent of Hong Kong's needs for cardiological equipment over the past few years, and this share of market is expected to remain steady in the near term because of users' high regard for American products. U.S. exports of pacemakers increased by 440 percent from 1978 to 1982, with sales of $5.6 million that year (see table 3). Japanese firms, however, have achieved spectacular growth in market share recently, primarily due to lower prices.

At least nine American firms are active in the market, with Hewlett Packard enjoying the dominant share due to its long-established reputation, good service backup, and highly rated technology. Japan's Nihon Kohden is next in significance. Its products are viewed as less sophisticated than those of Hewlett Packard, but are favorably priced and have good service support. It is one of at least three Japanese firms active in this market segment. A third major factor in the market is Electronics for Medicine, part of Honeywell Medical, (United States).

Pulmonary apparatus.—The market for pulmonary apparatus is dominated, and shared fairly equally, by manufacturers from the United States and the United Kingdom. At least 15 U.S. firms are active in the market, and their total share could increase to 70-80 percent in the next few years with appropriate marketing efforts. Leading suppliers include the following: Vitalograph (United Kingdom), dominant in the market for lung perfusion diagnostic equipment and spirometers; De Vilbiss (United States), leading in the market for nebulizers; Puritan Bennett (United States), major supplier of ventilation systems equipment; Ohio Medical (United States), tops in the portable resuscitation equipment market; and Medishield (United Kingdom), a major supplier of large resuscitation units used in hospitals. The opportunities for increased market share for U.S. manufacturers exist in most product categories, with the exception of large hospital resuscitation systems, where it may be difficult for U.S. makers to improve their share unless represented by medical gas manufacturers who could provide good backup service.

Neurological equipment.—Demand for neurological equipment in Hong Kong is focused primarily on electroencephalographs (EEG's) and electromyographs (EMG's) and is dominated by Japanese makers because of price. However, American makers enjoy a good reputation and their share of the market could increase as new technology equipment (ultrasound Doppler, evoked potentials, etc.) becomes more widely used. Nihon Kohden is the best-established supplier, serving about 60 percent of the market. Medelec (United Kingdom) is the next strongest supplier.

Ophthalmological equipment.—U.S. makers have a 50-60-percent market share of ophthalmological equipment sales in Hong Kong. This share has been quite steady and is expected to remain so in the next few years. Most ophthalmological clinics use only basic general and operating room equipment, and therefore the market for specialized devices is not well developed. Growth is also hampered by a shortage of

Table 3.—Hong Kong: Exports of medical equipment from the United States, 1978-82
(in thousands of U.S. dollars)

						Percentage change	
	1978	1979	1980	1981	1982	1978-82	1981-82
Medical instruments							
Pacemakers	1,039	628	1,296	3,170	5,611	440	77
Diathermy units	2	—	15	—	1	–49	
Ultrasonic therapeutic devices	43	48	43	30	167	288	456
Other therapeutic apparatus	506	546	898	1,573	2,931	479	86
Electrocardiographs	48	12	70	22	48	0	118
Electroencephalographs	—	22	—	72	—		–99
Complete patient monitoring systems	157	249	356	639	1,320	740	106
Electromedical apparatus, NSPF	1,492	2,500	2,355	2,158	3,322	122	53
Electromedical apparatus parts	187	181	206	385	628	235	63
X-ray tubes	15	24	16	63	143	853	126
Parts for X-ray tubes	3	—	—	—	—	–99	
X-ray apparatus & parts for medical or dental use	373	622	1,014	3,693	2,138	473	–42
Radiological apparatus & parts for medical or dental use	28	—	43	1	11	–60	1,000
Ophthalmic instruments & appliances & parts	386	291	411	338	629	62	86
Anesthetic apparatus & instr. & pts. (exc. syringes)	102	31	24	287	23	–77	–91
Bougies, catheters, drains, & soundes & parts	457	979	800	1,482	1,482	224	0
Basal metabolism & blood pressure apparatus, & parts	95	208	279	217	493	418	127
Hypodermic syringes, & parts	75	61	106	233	127	69	–45
Other syringes, & parts, NSPF	136	15	10	11	7	–94	–36
Other medical, etc. instruments & apparatus, & parts, NSPF	1,129	1,051	983	1,373	1,461	29	6
Subtotal	6,273	7,468	8,925	15,747	20,542	227	30
Medical and hospital appliances and equipment							
Sterilizers & autoclaves & parts	76	69	163	399	491	546	23
Wheelchairs, & parts	22	43	27	34	50	127	47
Other hospital, medical, dental, etc. furniture, NSPF	188	301	176	310	240	27	–22
Mechanotherapy appliances & massage apparatus, & parts	54	102	189	465	331	512	–28
Artificial respiration, ozone, oxygen, aerosol therapy etc.[1]	187	277	542	—	—		
Artificial respiration, NSPF	—	—	—	547	734		34
Hearing aids & parts, NSPF	38	33	56	52	65	71	25
Bone & joint prosthesis, plates, screws, nails, etc.	229	262	184	634	356	55	–43
Other orthopedic appliances	56	35	78	148	120	114	–18
Subtotal	850	1,122	1,415	2,589	2,387	180	–7
Medical supplies							
Other diagnostic agents (exc. biological) NSPF	123	128	304	208	221	79	6
Waddings, gauze, dressings, etc. w/medicinals	6	12	4	8	4	–33	–49
Other waddings etc. NSPF	280	520	438	571	649	131	13
Surgical sutures & materials etc., sterile	135	188	358	442	282	108	–36
Surgical and medical gloves	30	56	37	71	7	–76	–90
Hypodermic needles	68	30	24	23	26	–61	13
X-ray film, medical, exc. dental	217	443	2,583	2,097	1,986	815	–5
Other X-ray film	273	362	1,114	958	549	101	–42
Contact, ophthalmic lenses not mounted	81	295	581	354	657	711	85
Other ophthalmic lenses	390	311	539	928	1,744	347	87
Eyeglass, etc. frames, mountings & parts[2]	374	—	—	—			
Eyeglass fronts & temples	—	128	533	1,036	1,105		6
Parts, NSPF, for eyeglasses, lorgnettes, goggles, etc.	—	825	468	369	2,540		588
Subtotal	1,977	3,298	6,983	7,065	9,770	394	38
Total	9,100	11,888	17,323	25,401	32,699	259	28

[1] Product category was subdivided in 1981.

[2] Product category was subdivided in 1979.

Source: Compiled from official statistics of the U.S. Department of Commerce, Bureau of the Census.

trained ophthalmologists. The only widely used specialized equipment is ophthalmoscopes. The leading suppliers are Welch Allyn (United States) and Keller (United Kingdom). There may be some scope for selling instruments and disposables, but competition from Japanese and European suppliers is intense.

Pediatric equipment.—Pediatric equipment suppliers from both the United States and the United Kingdom are well respected in Hong Kong, and they should continue to share the market about equally between them. Infant intensive care systems and incubators will be in demand as new pediatric units came on stream. Airshields (Healthdyne) is perhaps the strongest U.S. supplier in the market, holding an important market share for infant intensive care systems and dominating the incubator market. Other important manufacturers are Medishield for tent systems and pressure resuscitation systems, Vickers

Medical (United Kingdom) with one-third of the market for intensive care systems, and Bourus (United States and Switzerland), another supplier of intensive care and resuscitation systems. There seems to be little demand for other types of sophisticated equipment such as cystic fibrosis analyzers, and fluorometers.

Renal equipment.—U.S. manufacturers have established a good position in the very volatile market for renal equipment in Hong Kong. The major supplier is Cobe (United States), supplying about two-thirds of the market with its good range of products. One area of substantial competition is disposable dialysers, with at least nine companies active in the $300,000 annual market. Another area of growing demand is in-bed scales, with American Scale (United States) the dominant supplier. A wide range of items will be needed for a new renal unit at Prince of Wales Hospital, Shatin. Most of this equipment is expected to come from U.S. suppliers.

Operating room equipment.—The market for operating room equipment in Hong Kong is very wide, diverse, and competitive, with manufacturers from the United States, United Kingdom, Germany, and Japan all well-established and expected to remain strong. For each particular item there is usually one supplier with a major position. U.S. makers do best in electrosurgical units (Bovi), heart/lung machines (Sarns), blood flowmeters (Gould-Stratham, Hewlett Packard, Narco Biosystems), surgical pacemakers (Medtronic), and cardiac catheters (USCI).

General hospital equipment.—The market for general hospital equipment in Hong Kong is very segmented, with a large number of suppliers, although U.S. firms seem to predominate. American manufacturers are particularly strong in most kinds of monitoring systems or other types of automated or electronically controlled equipment, where U.S. computer technology gives them a lead. However, this market could be subject to inroads from Japanese firms, as they have developed some good offers in terms of both price and technology. There also appears to be good potential for intensive care units (ICU's), ventilation systems, portable resuscitation units, and infusion pumps. The number of ICU's in Hong Kong hospitals is expected to increase significantly during the next 3-5 years.

X-ray and other radiology equipment is an important and expanding sector of the market. Whole body CAT scanners, have attracted considerable attention, and General Electric (U.S.) has been able to capture the market with units installed in the New Prince of Wales hospital as well as several of the recently expanded public hospitals. Other units are in a few private hospitals. Among foreign competitors, Toshiba leads with its head scanner.

The outlook is also good for high-energy X-ray equipment and apparatus using Tolbot therapeutic and after-loading techniques. About 10 high-energy X-ray machines could be sold in the next few years as radiotherapy units continue to expand.

The forecast for smaller systems using X-ray and ultrasound is less positive, with price-advantaged Japanese products having the leading edge. The market for nuclear scanners has yet to be developed, although it could offer sales potential for U.S. suppliers.

The Institute of Radiology and Oncology provides diagnostic and therapeutic services in hospitals and clinics. It handles more than 90 percent of the patients requiring radiotherapy. The institute also operates a cancer chemotherapy service and cancer registry.

Clinical laboratory equipment.—U.S. firms have the reputation for being the most technically advanced in the expanding clinical laboratory market in Hong Kong. Their sales efforts are enhanced by the training they provide for technicians and pathologists. Another advantage seems to be that a large proportion of the practicing pathologists and technicians received their medical training in the United States.

There is a definite need to expand and add clinical laboratories in both the public and private sectors in Hong Kong. A new pathology building is included in the Queen Elizabeth Hospital's extension plans, and a pathology unit is likely to be included in Princess Margaret Hospital. These units are expected to be equipment-intensive and should offer good sales opportunities.

The Institute of Pathology runs clinical and public health laboratory services for the government and a consultant service for the government-assisted sector. It also administers mortuaries and blood banks. Some vaccines are produced at the Institute of Immunology.

Miscellaneous health care equipment.—The high population density of Hong Kong within a small geographic area greatly reduces the need for mobile equipment. However, there are mobile dispensaries and floating clinics which bring medical services to the outlying islands and the more remote areas of the New Territories. Free medical services are offered at maternal and child health centers, family planning clinics, tuberculosis and chest clinics, floating clinics, casualty departments and through the 'flying doctor' service. The Pharmaceutical Service of the Medical and Health Department meets the requirements for drugs, dressings, surgical instruments and hospital sundries of all government hospitals, clinics and health centers including government-assisted medical institutions.

Disposable items are predominantly purchased from Japan, mainly for reasons of cost. Colposcopes are supplied mainly by Olympus (Japan).

Rehabilitation aids.—The market for rehabilitation aids in Hong Kong is small, except for orthopedic appliances and hearing aids. The leading supplier of orthopedic aids is Zimmer (United States), with a major share of the market. Danavox (Denmark) is the major supplier of hearing aids, with a 60-70 percent market share, while Marco (United States) has about 15 percent. A very small demand for artificial limbs is partly met by experimental production by the Hong Kong Government.

Health Care System

Health care in Hong Kong is under the overall direction of the Medical and Health Department of the Hong Kong Government. There are four broad administrative sections—Hong Kong Island, West Kowloon, East Kowloon, and West New Territories. Each area has a major acute regional hospital, one or more district hospitals providing basic hospital services, one or more specialist clinics for support and outpatient services, and general clinics for general outpatient and preventive health services.

The Medical and Health Department's estimated expenditure for the 1982-83 fiscal year was $226 million. In addition, subventions totaling about $128 million were made to many non-government medical institutions and organizations. From its budget, the Government provided, in directly owned and assisted hospitals, 88 percent of the 22,690 hospital beds available in Hong Kong in 1982 (4.3 per 1,000 population). It also employed 30 percent of the 4,137 registered doctors and 37 percent of the 12,323 nurses in 1982. There are 44 hospitals in Hong Kong: 14 government owned, 19 government assisted, and 11 private.

Government-assisted hospitals come under the general control of the Government, but are administered by separate committees, mainly voluntary. Tung Wah is the major group in this sector and runs three hospitals comprising over 2,500 beds out of the total 9,222 government-assisted hospital beds. The government provides about 5 percent of the total cost, varying from year to year with the advent of specific projects, with the remainder funded by charitable contributions. Other government-assisted hospitals are sponsored by religious groups, including the Catholic church and other Christian groups. Government-assisted hospitals, like government hospitals, charge patients only a nominal amount—less than $5 per day inclusive of all supplies.

Private hospitals are all self-financing, mainly from fees charged to patients. In some cases this is supplemented by endowments and charitable contributions.

Annual expenditures for medical equipment and supplies by all major end-users are expected to approach $48 million by 1986, compared to $38 million in 1980 (see table 4). General hospitals are the largest users, followed by physicians in private practice. University medical centers and specialized medical institutions fall next in rank.

Table 4.—Hong Kong: Estimated expenditures for medical equipment by major user sectors, 1980 and projected 1986
(in thousands of U.S. dollars)

	1980		1986	
	Equipment	Supplies	Equipment	Supplies
General hospitals	9,300	15,000	11,500	17,500
University medical centers	500	700	800	1,200
Specialized medical institutions, e.g. cancer clinics	600	1,000	800	1,200
Military hospital	200	500	250	600
Clinical laboratories	500	750	600	900
Mobile and permanent health care/population screening centers	300	500	400	700
Physicians (private practitioners)	3,500	5,000	4,250	6,750
Total	14,900	23,450	18,600	28,850

Source: See source notation of table 1.

Note: Projections are given in 1980 dollars, unadjusted for inflation. Supplies include disposables.

There are a number of major government projects underway or ahead. Among major recently completed hospital projects is the Prince of Wales hospital in Shatin. Opened in November 1982, it is a 1,400 bed regional hospital for the eastern New Territories. It will become operational in phases, starting October 1983, and serve as a teaching hospital for the medical school at the Chinese University of Hong Kong. The Medical and Health Department's development plans for the decade includes the construction of five major government hospitals—which means the completion of one hospital every two years. In addition to the Prince of Wales Hospital, a 1,600-bed hospital for Tuen Mun new town and three other 1,400 bed hospitals, in East Kowloon, Chai Wan and Tai Po, are under construction or being planned. Also in the plan are extensions to be added to the three existing government hospitals, Queen Mary Hospital, Queen Elizabeth Hospital and Princess Margaret Hospital. Some 20 general clinics and polyclinics are also due for completion during the decade.

Marketing Practices

Since Hong Kong is a relatively small market, as well as an expensive place to maintain an office, most suppliers choose to do business through one of the 40-50 local distributors. The operations of most distributors rely on the specialist knowledge of one or two principals, often former employees of a manufacturer or other distributor. One of the keys to success in the market is obtaining a good agent—one who provides not only good selling efforts but also adequate aftersale maintenance. Also, since most sales are achieved through direct contact with doctors, often on a social basis, a successful agent will have appropriate contacts within the medical community.

The Hong Kong government complies with the MTN protocol in government procurement. In the government sector, all items valued at HK$10,000 or more (about US$2,000) have to go to tender. The procedure begins in a hospital where a committee of nominated doctors prepares a specification. The committee is prohibited from citing an individual supplier, but because of technical complexities tender documents often say "Brand X or similar," and Brand X thus achieves a considerable advantage. Suppliers should therefore address their main selling effort toward the relevant doctors for the different types of equipment. The appropriate names may be obtained from the Department of Medical and Health Services, Lee Gardens, 4th Floor, Hysan Avenue, Hong Kong. The tender itself if processed by the Government Supplies Department. The director is R. Kilvert, Government Supplies Department, 12 Oil Street, North Point, Hong Kong. In theory, the order goes to the lowest tenderer. In practice, however, this is not always true, although doctors must justify their decision to buy a more expensive product. Reasons cited include superior service support, improved technology, and ultimate lower cost over the life of the product. Delivery time may also be a factor.

Pricing policies vary widely. The markup on landed price can vary from around 20 percent to well over 100 percent, particularly where a high degree of technical support is required. An average markup would be about 30 percent. There appears to be a lot of discounting, and small competitive items may have a low markup. Terms of payment are cash.

Trade Regulations

Hong Kong is a free port, and no customs duties are levied on medical equipment. Nontariff barriers are also nonexistent, with no legislation or agreements impinging on trade. Hong Kong is not classified as a developing country, and foreign aid is not a factor in influencing sales.

Technical Standards

There is no restriction on the importation of medical equipment to Hong Kong. However, most of the medical instruments and equipment are under British standards. There is no official agency to determine the technical standards and acceptability of medical equipment in Hong Kong. In general, however, Hong Kong is advanced by Asian standards, while lagging somewhat behind the West in application of the latest techniques.

Additional Information

The project officer responsible for Country Market Surveys on medical equipment is:

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For additional copies of this Survey or a catalog listing other Country Market Surveys, please contact:

International Market Research Services
OTIS/ITA, P.O. Box 14207
U.S. Department of Commerce
Washington, D.C. 20044

The Survey summarizes a 59-page research report prepared by P.A. Management Consultants Ltd. of Hong Kong, under contract for the U.S. Department of Commerce and reflects the opinions and views of interviewees and not those of the Department of Commerce. The research report gives considerably more detail on all the points touched upon in the Survey, as well as marketing practices, trade regulations, technical standards, and the names and addresses of prospective customers, potential agents and distributors, trade associations, and trade publications. A copy of this report may be purchased from:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161
Sales Desk telephone: (703) 487-4650

When placing an order for this research, please request "The Market for Medical Equipment—Hong Kong," ITA 82-06-503.

Other sources of information for this Survey include recent dispatches from U.S. foreign commercial posts in Hong Kong and trade statistics compiled by the Department of Commerce's Bureau of the Census.

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